Public Health Assessment for

LENZ OIL SERVICE INCORPORATED
LEMONT, COOK COUNTY, ILLINOIS
CERCLIS NO. ILD005451711
JULY 29, 1998

PUBLIC HEALTH ASSESSMENT

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Prepared by:

Illinois Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Service Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-56), Atlanta, GA 30333.

TABLE OF CONTENTS

SUMMARY

The Lenz Oil Service, a National Priorities List Site, operated for approximately 25 years, from 1961 to the 1980s, as an oil and solvent storage and transfer facility near Lemont, Illinois. Between 1980 and 1986, the owner also operated a licensed special waste hauling service and an asphalt supply service at the site. In 1986, the company and owner went bankrupt, and the facility was abandoned. Past practices at the facility contaminated soils, sediments, and groundwater with waste oils, industrial solvents, and asphalt derivatives, including aromatic compounds (e.g., benzene, xylenes, toluene), chlorinated solvents (e.g., methylene chloride, vinyl chloride, 1,2-dichloroethenes), polycyclic aromatic hydrocarbons (e.g., naphthalene and methylated naphthalenes), and polychlorinated biphenyls (e.g., Aroclor compounds). Residents living near the waste site were concerned about the contamination and the possibility of developing adverse health effects as a result of exposure to site contaminants. Children were known to play on the site, and some residents used water from private wells.

In 1988, the Illinois Environmental Protection Agency determined that the site required an immediate cleanup; therefore, waste from 55-gallon drums, tanks, surface sludges, and contaminated soils were incinerated. Fresh soil was added to the incinerated soil and replaced on site as backfill. Groundwater samples collected from January 1985 to June 1988 from monitoring wells and some residential wells contained volatile and semi-volatile organic chemicals. Five homes, within one-half mile south and southwest of the site, were connected to a community water supply in April 1988.

Before the immediate cleanup, individuals trespassing or working on the site may have been exposed to contaminants by inhalation and skin contact with contaminated surface water and soil. After the immediate cleanup, groundwater and some subsurface soil remain contaminated. Monitoring data from 1991 and 1992 indicated the presence of a layer of contaminants, which appeared to float on top of the groundwater. An investigation of this contaminant layer in 1994 provided additional groundwater information for the remedial investigation and feasibility study (RI/FS), which was completed in 1997. The U.S. Environmental Protection Agency Proposed Plan dated July 30, 1997, recommends that the groundwater contaminant layer be extracted for off-site disposal and that additional on-site treatment and disposal of remaining contaminated soil occur.

Based on the reviewed information, the Lenz Oil Service site near Lemont, Illinois, is currently considered to pose no public health hazard. People are not known to be exposured to site contaminants at this time. Before the availability of a community water supply in 1988, some residents using private wells may have been exposed to groundwater contaminants. Presently, people are not exposed to the residual surface soil contaminants found at the site.

The Illinois Department of Public Health recommends (1) that all contaminated private wells be properly sealed, (2) that institutional controls which prevent future use of the contaminated aquifer be implemented, (3) that access to the site be restricted, and (4) that ground cover be maintained to minimize wind and surface water erosion.

BACKGROUND

In cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), the Illinois Department of Public Health (IDPH) evaluated the public health significance of this site. More specifically, IDPH and ATSDR determined whether adverse health effects are possible as a result of exposure to site contaminants and recommended actions to reduce or prevent possible health effects. ATSDR, in Atlanta, Georgia, is a federal agency within the U.S. Department of Health and Human Services and is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or the "Superfund") to conduct public health assessments at hazardous waste sites.

A. Site Description and History

The Lenz Oil Service site (hereafter called the Lenz Oil site or the site) consists of 4.9 acres and is at the northeast intersection of Illinois Route 83 and Jeans Road in southeastern DuPage County, Illinois (Southeast quarter, Section 11, Township 37N, Range 11E, of the Sag Bridge, Illinois 7.5 minute quadrangle). The closest town is Lemont, Illinois, Cook County, approximately 3.5 miles southwest of the site.

Figure 1 shows the important topographical features near the site (14). This site is north of the Des Plaines River Diversion Channel in DuPage County and is in a flood plain and river discharge area. Figure 2 shows the specific land use of adjacent properties. The Lenz Oil site is currently a vacant, grassy area, containing a radio tower, monitoring wells, a fire hydrant, two underground utility man ways, and a drum storage area. The current site topography is a result of the Illinois Environmental Protection Agency's (IEPA) cleanup activities of 1988. Figures 3 and 4 illustrate the changes implemented at the site before and after the cleanup.

The site is bordered by the Atchison, Topeka and Santa Fe Railroad and an auto salvage business to the northwest, Illinois Route 83 to the southwest, Jeans Road to the southeast, and a private residence to the northeast. Other residences and small businesses are along Jeans Road. Several large industrial complexes are along the Des Plaines River upstream and downstream from the Lenz Oil site.

The Lenz Oil site began operation in 1961, operated under two different owners, and was an oil and solvent storage and transfer facility for more than 20 years. Wastes from several local and regional industries were accepted by the operators and stored in 55-gallon drums. Waste from truck tanks, above-ground tanks, and under-ground tanks were also deposited in unlined impoundments. Besides the storage and transfer business, between 1980 and 1986, the owner operated a licensed special waste hauling service and an asphalt supply service from the Lenz Oil site. Site features that existed before remediation are included in Figure 3.

Some oils were purchased and resold for road work material. Waste oils and solvents were collected from service stations and other small businesses. Some waste oil was unloaded and filtered and later sold as secondary #6 fuel. Solvents were reported to be reclaimed for recycling. Table 1 lists some of the known waste materials accepted by the waste site operators.

Lenz Oil Service, Incorporated, filed a Resource Conservation and Recovery Act Part A permit application for tank storage with the U.S. Environmental Protection Agency (USEPA) in 1980. A permit application was also submitted to IEPA for the development of a waste management site. Due to reported groundwater contamination, IEPA outlined five tasks that had to be completed before issuance of an operating permit for a storage and transfer facility for waste oils and solvents. In these tasks, Lenz Oil Service was required to assess the extent of groundwater contamination caused by oil and grease at the site, upgrade the quality of groundwater in the area, and limit further groundwater contamination by operational controls at the facility.

Lenz Oil Service contracted with Soil Testing Services, Inc., (STS) to analyze groundwater from two monitoring wells. The groundwater samples obtained from these wells in April 1981 contained ammonia, chloride, phenols, residue, and oil/grease that exceeded drinking water standards. STS again sampled the wells in October 1981 for oil/grease content only. No further groundwater data are known to exist from a Lenz Oil Service initiative. In October 1984, IEPA identified the Lenz Oil site as a potential hazardous waste site in a USEPA Preliminary Site Assessment. In 1985, Lenz Oil Service constructed three unlined surface ponds (or impoundments), filled them with oily waste, and removed them approximately 6 months later.

After numerous permit violations, including manifest infractions, inadequate waste handling practices, and reported releases of hazardous waste to local groundwater and surface water systems, IEPA submitted this case to the Illinois Attorney General's Office in the spring of 1985. The suit was filed in DuPage County Circuit Court, and in June 1985, the court ordered Lenz Oil Service to initiate immediate clean up actions, to file a site clean up plan, and to file a site closure and compliance plan. Lenz Oil failed to carry out major portions of the court order, and in April 1986, the company and its owner filed for bankruptcy. The facility was then abandoned.

IEPA and its contractors initiated an investigation of the Lenz Oil site. The following tasks were completed in 1986 to assist in site characterization:

- IEPA inventoried, sampled, and secured on-site drums, tanks, and truck tanks.
- The Lenz Oil site was surveyed with a metal detector to identify buried objects, such as piping systems and drums. IEPA concluded there were no buried drums.

- Six composite surface soil samples were collected to help characterize the extent of the site contamination. In addition, borings were removed to measure soil-gas levels, and 5 soil samples were collected from these borings.

- Eleven monitoring wells were installed to evaluate the hydrogeology of the Lenz Oil site and assess the groundwater.

- One non-community well (serving more than 25 people for less than 60 days each year) and 3 private wells down gradient of the Lenz Oil site were sampled on November 6, 1986, and January 22, 1987, and analyzed for volatile organic compounds (VOCs) and metals.

The Illinois Department of Public Health (IDPH) and IEPA offered to test the private wells of any homeowner living within 2 miles of the site for volatile organic compounds. Approximately 20 homes up-gradient of the Lenz Oil site took advantage of this offer. No site-related contaminants were detected in any of the 20 wells tested.

Based on the results from these investigations, IEPA determined that the Lenz Oil site required immediate cleanup. Table 13 lists some of the contaminant concentrations in the on-site soils of the site before the cleanup began. A permitted mobile incinerator, operated by an IEPA contractor, was set up on the Lenz Oil site. Table 13 also lists some post-incineration contaminant concentrations.

IEPA clean up activities were completed in July 1988. The cleanup consisted of the following tasks:

- All drum, tank, and truck tank contents were incinerated.

- The drums were shredded and incinerated, whereas the tanks and truck tanks were emptied, decontaminated, and transported off site.

- All buildings, and above-ground and under-ground structures were decontaminated and removed.

- Excavation to bedrock (about 13 to 15 feet) occurred near the underground storage tanks and where 55-gallon drums had been stored.

- Contaminated areas near the former unlined waste ponds, which were under several inches of fill, were excavated and incinerated.

- Approximately 21,000 tons of soil were excavated, incinerated, and replaced. The areas receiving this backfill were excavated to bedrock and lined with a thick plastic liner. Final grading of the site included the addition of topsoil, sludges from a water treatment plant, and sulfur.

- In April 1988, municipal water was made available to Jeans Road residents.

In 1984, IEPA referred the site to USEPA, and by 1989, the site was placed on the USEPA National Priorities List (NPL). The participating respondents conducted the RI activities except for investigation of the soil, surface water, and sediment. Two revisions of the RI were used as references for this public health assessment (see references 13 and 14). IEPA conducted the investigation of the soil, surface water, and sediment. USEPA and its contractors conducted the groundwater investigation. The RI/FS report became available in February 1997 and has been the basis for recommendations by USEPA for future cleanup. The RI/FS and additional information regarding groundwater and subsoil remediation will be the basis for a future IDPH site review and update.

B. Site Visits

Representatives of IDPH and IEPA visited the site on October 20, 1987, prior to IEPA clean up activities. IDPH staff continued to visit the site (March 21, 1990, May 11, 1990, and April 11, 1996). No other site visits are necessary until the site review and update process is initiated. Some post-incineration site features are depicted in Figure 4. The following features were observed during the visits:

- The site is visible from the Illinois Route 83 overpass on the western edge of the site.

- The site is in a sparsely populated, light industrial neighborhood.

- No people or buildings were seen on or near the site.

- The site was not well secured; gaps existed in the fence that consisted of cyclone, wooden, and wire fencing.

- Some monitoring wells' housings were rusted and damaged.

- Trash (including beer cans and food wrappers) along the inside of the fence may have been left there by trespassers.

- A radio tower was near the southern gate.

- Some scattered, grasslike vegetation was growing in the gray surface soil.

- Dirty, discolored standing water was observed in the northern drainage ditch; however, no odors were detected.

- Animal tracks were seen in the poorly drained soils at the northern edge of the site.

IDPH staff visited the site again on May 30, 1991, and found contractors working on site and noted the presence of a mobile trailer and well drilling equipment. A secure storage area had been constructed on site and contained large tanks of well processing water and barrels of cuttings from the drilling activities that took place during the installation of additional monitoring wells. The monitoring well locations are shown in Figure 5.

When IDPH conducted the most recent site visit, April 11, 1996, several 55-gallon drums were observed on site in a fenced area. Some drums appeared to have been disturbed by trespassers. Many fence sections remain in poor repair.

C. Demographics, Land Use, and Natural Resource Use

Demographics

No individuals live or permanently work on the Lenz Oil site, although approximately 400 people live within 1 mile of the site. IDPH estimates that about 6,000 people live within 3 miles of the site.

Land Use

Figure 2 illustrates some of the nearby land use around the site. Between the railroad tracks and the site property line, along the northwest border, is a small drainage ditch that flows southwest during wet periods and may eventually empty into the Des Plaines River, approximately 600 to 1,000 feet southeast of the site. The Chicago Sanitary and Ship Canal parallels the river and is about 5,000 feet from the site. The drainage way leads into a large automobile scrap yard west of the Route 83 highway. An additional automobile wrecking facility exists south of Jeans Road. According to a feasibility study (FS) (15), oil pipelines owned by three companies pass under the drainage ditch immediately downstream of the site. Large industrial complexes are upstream and downstream of the site.

Natural Resource Use

A review of the well construction records conducted for the RI (13) identified a total of 310 residential, commercial, and industrial wells approximately two miles or less from the site. Most of the private wells are up gradient of the site. The groundwater flows toward the southeast and the Des Plaines River Valley. The wells south of the Des Plaines River Valley are isolated from the groundwater affected by the Lenz Oil site. The area of concern remains the area between the site and the river. Private residences and small businesses occupy the land adjoining the Lenz Oil site to the south and east and along Jeans Road. The closest residential property shares the northeast site fence line. Another residence is approximately

200 feet southwest of the site, across Jeans Road. Approximately five homes are within one-half mile south and southeast of the Lenz Oil site. Since April 1988, when municipal water supply lines were installed, none of these residences used groundwater for potable purposes.

The site is in the Des Plaines River flood plain. Bluffs north of the railroad tracks are about 75 feet higher than the site and define the northern boundary of the Des Plaines River Valley (7). The site and most of the surrounding areas are either idle or undeveloped. Eight forest and nature preserves are within 5 miles of the site (13).

D. Health Outcome Data

By using state health databases, IDPH can sometimes determine whether certain health effects are higher than expected in a particular area, such as in an exposed population near a hazardous waste site (1). This section identifies available, relevant databases; their evaluation is in the *Public Health Implications* section of this document.

In 1984, the Illinois Health and Hazardous Substances Registry Act was signed into law. Because of this Act, the Illinois Health and Hazardous Substances Registry was created. The main purpose of the registry is to monitor health effects among the citizens of Illinois related to exposures to hazardous substances in the work place and in the environment. Specifically, the registry is a unified, statewide project to collect, compile, and correlate information on public health and hazardous substances. The registry consists of the compilation of information in the following categories:

1. Cancer incidence.
2. Adverse pregnancy outcomes.
3. Occupational diseases.
4. Hazardous nuclear materials.
5. Hazardous substances incidents.

The Illinois State Cancer Registry (ISCR) is one of the registries developed as a result of this Act. As of January 1, 1985, mandated reports of all cancer patients newly diagnosed in non-federal Illinois hospitals are reported to ISCR. In addition, some federal hospitals in Illinois report cases voluntarily. Some bordering states also exchange cancer data with Illinois. The ISCR is the prime source for information on cancer incidence within the state.

COMMUNITY HEALTH CONCERNS

On August 9, 1985, the Southeast DuPage Homeowners Association wrote to the Illinois Attorney General's Office regarding the Lenz Oil site. At that time, all area residences used well water for drinking; therefore, they were concerned about potential exposure, specifically to chlorinated solvents. The residents also asked how the agencies involved planned to remediate and monitor this site.

In December 1986, a representative of the Forest Preserve District of DuPage County wrote IEPA regarding the long-term effects the site may have on the region. Area residents were concerned because their children were known to play on the site.

IEPA published a public notice in three area newspapers beginning at the end of March 1987 and collected comments from concerned individuals. A public hearing was held on April 30, 1987, in Willowbrook, Illinois, to discuss incineration of wastes at the site and to respond to written public comments submitted to IEPA. During this hearing, health-based questions and questions regarding emission and dust control were answered. A Lenz Oil Review Committee, made up of nearby residents, representatives of local businesses, and local government officials, met once a month during the IEPA cleanup that started June 29, 1987. At that time, most of the discussions involved the incineration process (21).

In May 1987, a representative of the DuPage County Health Department sent a letter to IEPA because of their concern about incineration emissions affecting the health of the residents living on the bluff above the site and traffic safety on the Illinois Route 83 overpass.

People living around the waste site are concerned about the contaminated groundwater and any related potential health effects. At this time, IDPH estimates that the contaminated aquifer potentially affects two private residential wells. Neither well has been sealed, although both the homes are connected to municipal water.

This public health assessment was released for public comment on August 6, 1997. The comment period was open until September 5, 1997. IDPH did not receive any comments or inquiries about information contained in the document.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

The tables in this section list the contaminants selected for further evaluation associated with the Lenz Oil site. These contaminants are further evaluated in the remaining sections of this public health assessment to determine if they pose a threat to public health. **The listing of a contaminant in the following tables does not necessarily mean that the contaminant poses a threat to public health.** The selection of these contaminants is based on the following factors:

1. Concentrations of contaminants found on and off the site.

2. Data quality, both in the field and in the laboratory, and sampling plan design.

3. Comparison of contaminant concentrations and background concentrations with environmental media comparison values (discussed further in this section).

4. Community health concerns.

Comparison values are media-specific chemical concentrations used to select contaminants for further evaluation. These values include Environmental Media Evaluation Guides (EMEGs), Cancer Risk Evaluation Guides (CREGs), Reference Dose Media Evaluation Guides (RMEGs), Lifetime Health Advisories (LTHAs), and Maximum Contaminant Levels (MCLs). If a site-related contaminant is found at levels above any of these comparison values or if no comparison value exists for the chemical in that medium (air, water, or soil), the contaminant is evaluated further in the remaining sections of this document to determine if it poses a significant threat, upon exposure, to public health. Known or suspected human carcinogens with no carcinogenic comparison value are listed as a contaminants of concern and are evaluated in the remaining sections of this public health assessment.

EMEGs are comparison values developed for chemicals that are relatively toxic, frequently encountered at NPL sites, and present a potential for human exposure. They are derived to protect the most sensitive members of the population (e.g., children) and are not cut-off levels, but rather comparison values. As developed, ATSDR did not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure. They are very conservative concentration values.

CREGs are estimated contaminant concentrations based on one excess cancer in a million persons exposed to a chemical over a lifetime (70 years). These are also very conservative values designed to protect sensitive members of the population.

RMEGs are estimates of a daily oral exposure to a particular chemical that are unlikely to produce any noncarcinogenic adverse health effects over a lifetime. They are based on USEPA reference doses (RfDs) and are conservative values designed to protect sensitive members of the population.

RfCs are estimated air concentrations an individual can breathe for a lifetime (70 years) without experiencing adverse health effects. They are developed by USEPA.

LTHAs are estimated water concentrations an individual can drink for 70 years without experiencing noncarcinogenic health effects. These numbers contain a margin of safety to protect sensitive members of the population. These values are established by USEPA and are considered only if no EMEG, CREG, or RMEG is available for the chemical.

USEPA established MCLs for public water supplies to reduce the chances of adverse health effects from drinking contaminated water. These standards reflect the best achievable levels considering the occurrence, relative source contribution factors, monitoring capabilities, cost of treatment, available technology, and health effects. These are enforceable limits that public water supplies must meet. These values are considered only if no EMEG, CREG, RMEG, or LTHA is available for the chemical. Proposed Maximum Contaminant Levels (PMCLs) are also sometimes used in the absence of MCLs. These are proposed standards under consideration by USEPA.

USEPA has also established Soil Screening Levels (SSLs), which they use to determine if a site needs further characterization. These values are used only for soil and if no other comparison value is available.

Before clean up activities, oils, solvents, asphalts, and metals stored in above-ground and under-ground tanks, 55-gallon drums and truck tanks were the primary sources of contamination. The mechanisms of release included leaking tanks and drums, nonexistent overflow structures, construction of poorly designed surface impoundments, spills, and poor housekeeping at the site during daily operation. Accumulation of these waste oils and solvents spanned 25 years. All of the source material in containers, in impoundments, or in badly contaminated soil was removed or incinerated. Therefore, preclean-up contaminant concentration data have not been used to determine health risks at the site. Instead, sample collection and analyses completed in 1991 and 1992 provide the basis for characterizing the health risks found at Lenz Oil in this public health assessment. Some residual contaminated soils, sediments, and groundwater remain. The management of the residual waste is discussed in the RI/FS published in February 1997 (30) and in the USEPA Proposed Plan of July 1997 (31).

The unremediated, contaminated groundwater remains the primary concern. The highly contaminated nonaqueous phase liquid at the surface of the site's underlying aquifer has high concentrations of many contaminants. How quickly contaminants are migrating from the floating contaminant layer into the underlying groundwater has not yet been determined.

A. On-site Contamination

Waste Source

The contents of storage containers and structures were sampled and analyzed during the summer and fall cleanup of 1986. Many volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and metals are associated with the site-related wastes.

IEPA sampled sludges in the unlined waste ponds in February and May 1985. Table 13 lists some of the contamination concentrations known before the immediate clean up activities. High concentrations of many oil- and solvent-based contaminants were identified in this on-site "surface water." Aerial photographs from 1954 to present did not show any permanent natural surface water on site (7).

Besides the wastes in the impoundment areas, contamination of environmental media on site was also caused by leaking drums, tanks, and poor housekeeping. Once, standing oil covered an estimated 25 percent of the facility. Storage tanks were close to overflowing when the site was abandoned, and virtually no containment structures for leaks or overflow had been erected.

Soil

Table 13 lists the identified contaminants found in surface and subsurface soils before IEPA clean up efforts. The analytical results of sampling from the 1992 RI report provided data for a current soil characterization (13). Tables 4, 5, and 6 summarize the RI data for soil contamination on site. January and February 1991 sampling did not meet QA/QC requirements for several results reported simply as "unknown volatiles" or "unknown semi-volatiles." Only the known contaminants are listed. Additional soil and sediment samples were collected in 1992. Surface and subsurface borings were collected and analyzed for VOCs, SVOCs, pesticides, PCBs, and metals.

Generally, surface soil borings had lower VOC concentrations than subsurface samples. The detected VOCs of concern in the on-site soils include aromatic solvents (benzene, toluene, ethylbenzene, and xylene) and chlorinated solvents (1,1-dichloroethane, 1,2-dichloroethane, trichloroethene, 1,1,1-trichloroethane, and tetrachloroethene).

No pattern of distribution was evident for detected SVOCs in on-site soils. The detected SVOCs of concern include naphthalene, 2-methylnaphthalene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, dibenzofuran, and di-n-butylphthalate. The SVOCs were numerous and frequently found, but at low concentrations. This is not unexpected since burning carbon-containing compounds generates some SVOCs. Polychlorinated biphenyls or PCBs (e.g. Aroclor-1248 and Aroclor-1254) were also found. The on-site soil concentrations that exceeded an environmental media comparison value include benzo(a)pyrene and PCBs.

The results of on-site soil and sediment inorganic chemical analyses are summarized in Table 6. Antimony and arsenic were detected in concentrations above environmental media comparison values for a child's exposure. However, other metals could be considered contaminants of concern if compared to values determined for a child with a propensity to eat dirt (a pica child). Most children with pica are very young and not likely to venture onto a site unobserved. No comparison values have been set for aluminum, cobalt, copper, iron, lead, or mercury.

Groundwater

The aquifer immediately under the site is contaminated because of its close proximity to the surface and because it is not naturally protected from contaminants leaching directly into it. In fact, the site is considered part of the aquifer's natural recharge zone. Regional groundwater flow is generally south-southeast, toward the Des Plaines River (13). However, seasonal meteorological factors, the slight northwest slope of the site, and the drainage ditch to the north may influence this principle. Hydrogeolog[illegible] data reveal some variation in the groundwater flow direction at the site.

After monitoring wells were installed at Lenz Oil, water samples collected in June 1982 by STS and in May 1984 by IEPA staff were observed to be very oily and dirty. Eleven wells were installed by the state in 1986, and additional wells were installed for an investigation in 1991. The wells that were still in use at that time are illustrated in Figure 5.

Data from on-site monitoring wells (sampled May 1991) with confirmed concentration values include toluene (6 parts per billion or ppb) and chloroethane (53 ppb). Compounds identified with estimated concentrations include total xylenes (920 ppb), ethylbenzene (370 ppb), 1,2-dichloroethane (31 ppb), 1,1-dichloroethane (28 ppb), chloroform (14 ppb), total 1,2-dichloroethene (3 ppb), and trichloroethene (2 ppb).

Many organic compounds have been found at high concentrations in the nonaqueous liquid from on-site wells. They are listed in the first column of Table 2. The maximum thickness of the nonaqueous liquid has been estimated to be 1.3 feet. Sampling to date does not show whether the nonaqueous layer covers the entire surface of the underlying aquifer. Because the analyses for these contaminants were different than analyses for water, the detection limits were much higher than those normally used for drinking water, and the substance is likely to contain additional chemicals. In addition, many tentatively identified compounds were found in the floating contaminant layer, and the total organic concentration was very high.

Contaminants in the groundwater are also listed in Table 2. Of the detected organic compounds in on-site groundwater, benzene, vinyl chloride, 1,1-dichloroethene, 1,2-dichloroethane, tetrachloroethene, naphthalene, fluorene, and PCBs were detected at concentrations above their drinking water comparison values.

The inorganic contaminants detected in on-site groundwater (Table 3) monitoring wells at levels above comparison values include arsenic, barium, chromium, lead, and selenium.

B. Off-site Contamination

Soils

Three background soil samples from the area north of the railroad tracks, upgradient of the site, were checked for VOCs, SVOCs, pesticides, and PCBs. Only one VOC was detected at a low concentration (1,1,1-trichloroethane at 5 ppb). Note that 1,1,1-trichloroethane was reported released into the environment (Table 12).

Surface samples were collected around the northern drainage ditch. Samples from the southeastern side of this ditch contained some detectable concentrations of aromatic and chlorinated solvents, including trichloroethane, tetrachloroethane, toluene, ethylbenzene, and xylenes. All these compounds were detected at levels below comparison values.

Soil Gas Survey

Lighter weight (or low molecular weight) organic compounds are often called volatile organic compounds or VOCs. Heavier complex organic compounds are often called semi-volatile (sometimes called SVOCs), which means they are less likely to evaporate than VOCs. A possibility exists that low molecular weight contaminants can be released into the air from subsurface soils during excavation. Once released, the VOCs will quickly move off site in the direction of the prevailing wind. A soil gas analysis conducted on site before clean up operations in May 1987 (Table 10) revealed five VOCs present in significant concentrations.

During state clean up efforts, contractors covered soil that was waiting to be incinerated and used foam to reduce dust and emissions during excavation. Therefore, off-site emissions were likely kept to a minimum. Ambient off-site air monitored during July 1987 (Table 11) detected only slight concentrations of ambient VOCs while incineration was underway.

A second soil gas survey revealed the presence of lower concentrations of volatile organic compounds. Of 32 soil gas samples collected south of the Lenz Oil site during a post-cleanup soil gas investigation conducted in January 1991, only two had detectable values of VOCs. The low temperatures during January may have reduced volatilization of some of the contaminants. However, this information was useful in estimating the extent to which underground contamination has migrated. Trichloroethene (0.1 parts per million or ppm), 1,1,1-trichloroethane (0.05 ppm), and 1,2-dichloroethane (0.23 ppm) were identified in samples collected across Jeans Road. That suggests that the groundwater contamination has migrated to at least as far as these sample locations.

VOCs are part of the subterranean, non-aqueous liquid layer and subsurface soils, and they could potentially be released if the ground is disturbed or if the non-aqueous liquid layer migrates closer to residential basements or to the surface.

Sediments

IEPA collected six drainage ditch sediment samples during the RI. No VOCs, PCBs, or pesticides were detected that could be attributed to contamination from the site. However, the following SVOCs were detected: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, anthracene, phenanthrene, and 2-methylnaphthalene. The SVOC that exceeded the comparison value was benzo(a)pyrene.

Inorganic contaminants were also detected in sediments of the drainage ditch (Table 6), but they have not been conclusively attributed to past activities at the site.

Surface Water

When IEPA conducted an investigation in February 1985, contaminated surface water flowing off-site was sampled. The sample was collected immediately north of the Lenz Oil site property line, south of the railroad right-of-way. IEPA personnel observed that this liquid material appeared to be flowing through a berm into an unnamed drainage ditch to the north, which flows into a tributary of the Des Plaines River. Six samples were collected for the recent RI investigation and were analyzed for VOCs, SVOCs, metals, PCBs, and pesticides. Several tentatively identified SVOCs compounds were found, which were not evaluated for this public health assessment. No VOCs, PCBs, or pesticides were detected. The inorganic analyses results are included in Table 7. The elevated metals detected in this drainage ditch have not been conclusively attributed to the Lenz Oil site.

Groundwater

Three off-site wells are considered background wells because they were installed upgradient and north of the site (G101M, G101L, and G101D). The data from the background wells are included in groundwater tables for comparison purposes. The information is especially important for inorganic compounds that do not have comparison values or for which comparison values are much less than naturally occurring values for the area. Chlorinated solvents have been found in the deep background well.

In March 1985, IEPA sampled five private wells located near the site. VOCs were detected in two wells, and acetone was tentatively identified in one well. Later, analytical results of samples collected from some downgradient private wells in 1986 identified the presence of low levels of VOCs.

The Lenz residence well (Figure 3), 100 feet northeast of the site, was screened for VOCs, SVOCs, PCBs, and pesticides, and inorganics during the RI. No compounds attributed to the site were found in the sample. Samples from this well have historically never contained any contamination. Samples from the bait shop well, approximately 100 feet south of the site, across Jeans Road, have contained some contamination in the past, but this well was not resampled in the recent investigation. The owner refused to have the well sealed.

Much of the data from samples collected between May 6 and May 9, 1991, regarding groundwater contamination were qualified or rejected during data validation activities (18). Only the VOC results were considered usable. The SVOCs, PCBs, pesticides, and inorganic results were rejected. Background groundwater samples in one upgradient location, north of the site, beyond the railroad tracks, contained trace concentrations (estimated to be 2 to 3 ppb) of 1,1-dichloroethene, chloroform, 1,1,1-trichloroethane, carbon tetrachloride, and tetrachloroethene.

The organic contaminants found in off-site wells at levels above their comparison values include vinyl chloride, 1,1-dichloroethene, trichloroethene, carbon tetrachloride, and tetrachloroethene. The inorganic contaminants detected in off-site wells at levels above comparison values include arsenic and lead.

Many chlorinated solvents have been detected at low concentrations in the monitoring wells south of the site. Soil gas results, however, suggest that the groundwater plume has migrated since the past characterization efforts. Additional groundwater sampling has been conducted to provide guidance for remediation plans (30 and 31).

Air

In June 1987, during site incineration activities, ambient air sampling was conducted downwind of the site. Downwind sampling results showed only slight increases of VOCs over air sampling conducted upwind. The results of this air monitoring are summarized in Table 11 (22). The VOC levels were similar to those detected in Chicago during the same period.

Besides the review of currently available data concerning off-site contamination, the USEPA Toxic Chemical Release Inventory (TRI) was searched for the site and local area for 1987 through 1991 (27). This database contains information on environmental releases from active industrial facilities. Table 12 summarizes environmental releases from a variety of industries in the area. Most of these industries are in Lemont, 3.5 miles southwest and downgradient from the site. This information can give a general idea regarding the volume and types of emissions from manufacturing facilities that may be contributing an additional environmental burden to a potential population of concern. Many site-related contaminants are also reported on this database.

C. Quality Assurance and Quality Control

In preparing this public health assessment, IDPH relies on the information provided in the referenced documents and assumes that adequate quality assurance and quality control measures were followed with regard to chain-of-custody of samples, laboratory procedures, and data reporting. The analyses and conclusions in this public health assessment are valid only if the referenced information is complete and reliable.

Validation of data from the Lenz Oil site has ensured that the data meet quality assurances. Several deficiencies have been identified throughout these investigations, and some data have been rejected. In some instances, entire sampling rounds were dismissed as unusable.

D. Physical and Other Hazards

Fire and explosive conditions existed when large volumes of solvents were stored at the site. Presently, no fire or explosive hazards are present on the site. The site has been graded, and access is restricted from Jeans Road by a chain-link fence with several locked gates. This chain-link fence connects to a wooden privacy fence at the northeast border between the Lenz Oil site and the nearest residential property. Gaps in the fence do exist under the Illinois Route 83 overpass and along the railroad right-of-way to the north. Three nonfunctional monitoring wells were sealed. Some underground utilities exist and must be considered during boring and drilling activities. The underground plastic liner surrounding the incinerated soil has been reported to have been punctured during some sampling activities.

PATHWAYS ANALYSES

Chemicals disposed on site can migrate into other media such as soil, sediment, surface water, groundwater, and air. During rain storms, soil contaminants can migrate in surface water runoff to ditches, roads, channels, and rivers. Once in these waterways, contaminants can be transported downstream until they are either deposited as sediment, degraded by bacteria, translocated through evaporation into the air, or percolated into groundwater. In addition, rain water may percolate through soil and leach contaminants into groundwater beneath. Once in groundwater, contaminants will migrate in the direction of groundwater flow until degraded by bacteria, removed through a manmade structure, or released into a low-lying surface water body. Contaminants that are adsorbed to surface soils may be carried by the wind to nearby areas. If contaminants in surface soils are volatile or are uncovered, they may evaporate and move off site in air.

Once people are exposed to a chemical present in the environment, their bodies may absorb the chemical by inhalation, skin absorption, and ingestion. At the Lenz Oil site, before remediation, the hazardous materials stored on site and released into the environment became the source for contamination of several media including air, soil, groundwater, surface water, and sediments.

A hazardous material can affect people only if they contact it at a sufficient concentration to cause a toxic effect. This requires a source of exposure, an environmental transport medium, a route of exposure, and an exposed population at the point of exposure. A pathway is complete if all of its components are present and people were exposed in the past, are currently exposed, or will be exposed in the future. If (1) parts of a pathway are absent, (2) data are insufficient to determine if the pathway is complete, or (3) exposure may occur at some time (past, present, future), then it is a potential exposure pathway. If a part of a pathway is not present and will never exist, the pathway is considered incomplete and can be eliminated from further consideration. The site-specific completed and potential exposure pathways are discussed in this section and presented in Tables 14 and 15. No current completed exposure pathway has been verified.

A. Completed Exposure Pathways

Wastes

Workers and nearby residents were exposed in the past to the wastes handled and stored on site during the years the site was in operation. However, data are insufficient to evaluate any possible health effects that may have been caused by such exposure.

Groundwater

Surface waste formerly stored on site leached through the soil and easily entered the groundwater because the water table is high and the aquifer is naturally unprotected. Private wells became contaminated, and residents living downgradient from the site, between the site and the Des Plaines River, likely ingested some contaminants before their homes were connected to the community drinking water supply lines. Residents likely also inhaled low levels of volatile contaminants when using water from their private wells. Until all the private wells are sealed, such exposure may continue.

Surface Water

Although no receptors have been specifically identified, people likely used nearby surface water for recreation or other purposes at some time. Runoff from the site during precipitation events has historically carried contamination from the site surface into nearby ditches and streams and, ultimately, to the Des Plaines River. No storm sewers are in the area; therefore, the contamination has remained accessible to nearby residents. The contaminated groundwater likely discharges to the Des Plaines River, especially during periods of high water table. However, exposures to contaminated surface water would likely be infrequent and of short duration. The contaminant levels are low in the surface water, and exposure would not expected to result in adverse health effects.

B. Potential Exposure Pathways

Groundwater

The groundwater remains unremediated and is currently the contaminated environmental medium of greatest concern. The non-aqueous phase liquid at the surface of the aquifer has very high concentrations of contaminants, whereas the underlying groundwater has only a low frequency of detectable organic compounds. The groundwater contamination plume has been estimated to be approximately 31 feet below the surface and may extend 60 feet off site (7). As previously stated, VOCs have been identified in the downgradient private well across Jeans Road to the south. If the contaminant plume migrates to more distant private wells, community water supplies, or discharges into surface waters, people could be exposed to the contaminants if they use their drinking water wells; however, no receptors have been identified to date. If wells are drilled into this plume or the river becomes a drinking water source for people closer to the source of contamination, the number of individuals exposed to this contamination may increase.

Homes of nearby residents living downgradient of the site have been connected to a municipal water supply, but wells that are not sealed may be used for general household purposes. Domestic use of this contaminated water could expose residents, either through skin contact or inhalation, to contaminants in their well water. Inhalation is the most likely exposure route because most of the contaminants readily evaporate. If the non-aqueous liquid migrates near homes having basements, the potential for inhalation exposure becomes greater.

Sediment

Sediments that have and are continuing to accumulate contaminants could be a source of exposure to recreational users of area waterways. The northern drainage ditch has always been and remains unsecured. In addition, exposures may occur if the northern drainage ditch is disturbed or if any sediments migrate to areas that are known to be used.

Soil

The incineration used in the immediate clean up of the site did not destroy all of the contaminants in surface and subsurface soils. Also, the incinerator ash may have contained heavy metals and some nondegraded contaminants. Direct contact with remaining contaminated soils or ash can occur to individuals working on the site or trespassing. Trespassers can easily gain access through gaps in the fence. Soil contaminants from the site could be carried or tracked into homes (on shoes or clothing) by children or other site trespassers. Contaminants may even be tracked into a home by a family pet that wanders on site. Such home contamination may put toddlers at risk.

In the past, during facility operations and during soil excavation by IEPA, VOCs released to ambient air were a potential source of exposure. However, air data collected during clean up activities showed that air concentrations of contaminants did not reach levels that exceeded comparison values.

If future development occurs on this site, on-site visitors or residents could be exposed to hazardous substances still present in soil.

PUBLIC HEALTH IMPLICATIONS

This section includes discussions on the possible health effects experienced by people exposed to specific site-related contaminants, on any applicable state and local health databases, and on specific community health concerns.

A. Toxicological Evaluation

To evaluate health effects, Minimal Risk Levels (MRLs) have been developed for compounds commonly found at hazardous waste sites. The MRL is an estimate of the daily human exposure to a contaminant below which adverse, non-cancer, health effects are not likely to occur. MRLs are developed for different routes of exposure, including ingestion and inhalation, and for three different exposure periods, acute (less than 14 days), intermediate (15-365 days), and chronic (more than 365 days).

ATSDR has developed *Toxicological Profiles* for contaminants that are common at hazardous waste sites. The *Toxicological Profiles* are specific for individual chemicals. The *Toxicological Profiles* referenced fo his discussion are: benzene, toluene, ethylbenzene, xylene, vinyl chloride, polycyclic aromatic hydrocarbons (PAHs), PCBs, aluminum, arsenic, barium, cadmium, chromium, lead, manganese, nickel, selenium, and zinc. The profiles contain information on health effects, environmental transport, human exposure, and regulatory status of each chemical.

Most of the toxicological information presented in this section focuses on site-related exposures. Usually, adverse health effects are known only as a result of occupational exposure situations where individuals were exposed to very high chemical concentrations. In all cases, the probability an adverse effect will occur is dependant upon the exposure concentration and the amount of time an individual is exposed.

Chlorinated Solvents

This group of VOCs is commonly used in industry and has been found to be prevalent at the Lenz Oil site. Local industries reported releases of many chlorinated solvents on the TRI (Table 12). These compounds consist of chlorine, carbon, and hydrogen. Following incineration, most of the soil concentrations of these compounds were reduced to levels below comparison values. Many chlorinated solvents continue to be detected frequently in several environmental media but at low concentrations. Some have been selected only because they are so commonly found, not because they exist at levels above comparison values. Chlorinated solvents detected at Lenz Oil and selected for further evaluation include chloroethane, vinyl chloride, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, trichloroethene, 1,1,1-trichloroethane, carbon tetrachloride, and tetrachloroethene. Table 8 lists the environmental medium where solvents containing chlorine were found.

IDPH found an abundance of information regarding health effects resulting from high-dose exposures to chlorinated solvents in animals and man. In humans, most of these data are a result of occupational exposures. More information is needed regarding long-term, low-dose exposures to these common contaminants. However, the main health effects associated with this type of exposure are believed to include elevated cancer risk, adverse reproductive outcome, and adverse effects to the nervous system. Many chlorinated solvents can cause cancers in laboratory animals exposed to high doses.

Studies have shown that one chlorinated solvent, **vinyl chloride**, increases the risk of liver cancer in workers who have been occupationally exposed. However, studies of human populations exposed to these compounds through drinking water have not provided strong evidence for an increased risk of developing cancer (2). Because of the uncertainty, chlorinated solvents are considered possible or potential human carcinogens. Vinyl chloride was detected in two samples of off-site groundwater.

Aromatic Solvents

This group of VOCs has also been found at this site; however, these solvents do not have chlorine associated with them. They easily volatilize into the air. High concentrations of **xylenes** have been found at Lenz Oil. Studies show that long-term inhalation at concentrations of 230 to 800 parts per million (ppm) in animals has caused heart rate changes and abnormal blood flow. At levels of 100 to 299 ppm, eye, nose, and throat irritation occurs and breathing becomes difficult. Impaired memory, headaches, and decreased coordination are nervous system disorders associated with long-term exposures to relatively high concentrations of xylenes. In waste sites where xylenes are present, it is typical to also find related chemicals, **benzene, toluene,** and **ethylbenzene**. All four of these solvents have been detected in on-site soils but below levels of concern. Toluene, ethylbenzene, and xylenes have been found in the nonaqueous liquid at Lenz Oil at high concentrations.

Benzene is a known human carcinogen. Individuals exposed in occupational settings for long periods of time have experienced changes in blood forming tissues and blood disorders. The type of cancer associated with long-term, high-dose benzene exposure is cancer of tissues that form white blood cells or leukemia (2). Benzene has been detected at levels of concern in two groundwater samples from on-site monitoring wells. Benzene was not detected in any other environmental samples and has not been found in private wells.

Semivolatile Organic Compounds

Most of the semivolatile organic compounds of concern at the Lenz Oil site are a class of related compounds called polycyclic aromatic hydrocarbons or **PAHs**. The PAHs detected in more than one medium at the Lenz Oil site include: naphthalene, 2-methylnaphthalene, anthracene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, fluorene, dibenzofuran, phenanthrene, and acenaphthene. They were most frequently found in on-site soil samples at low concentrations. The PAHs detected above comparison values include naphthalene, benzo(a)pyrene, fluorene, and acenaphthene.

Naphthalene and 2-methylnaphthalene are examples of substances that have been associated with hemolytic anemia (the breakdown of red blood cells). In addition, ingestion has been known to cause nausea, vomiting, and diarrhea (2).

Naphthalene was detected in the nonaqueous liquid, on-site groundwater, and on-site soil samples. The concentration of all the contaminants in the nonaqueous liquid was much higher than in any other water sample. Naphthalene was found in 18 on-site soil samples, and the highest concentration detected was 10 ppm. Naphthalene has the highest vapor pressure of the PAHs, which means that it will volatilize more readily than others. The combustion of fossil fuel is the major source of airborne naphthalene (2).

Naphthalene exposure in humans at levels well above those levels found at the site have caused hemolytic anemia, nausea, vomiting, diarrhea, kidney damage, jaundice, and liver damage. The effects are seen from both inhalation and ingestion (2). These effects would not be expected to be exhibited from exposure to naphthalene-containing soils at Lenz Oil. There is not enough animal or human data to classify the carcinogenicity of naphthalene.

Phenanthrene was the most frequently detected SVOC in the on-site soil and the north drainage ditch sediments. The highest concentration of phenanthrene was 12 ppm in the sediment. Phenanthrene was not detected in any water samples. No comparison values are available for phenanthrene.

Benzo(a)pyrene was found above a level of concern in 25 soil samples. The highest concentration was 4.5 ppm. Benzo(a)pyrene is classified by USEPA as a probable human carcinogen, which means there is adequate animal data but insufficient human data to classify it as a known carcinogen. The non-carcinogenic effects of PAHs are based primarily on animal studies where the animals were exposed to much higher levels than those associated with possible exposures at this site. Benzo(a)pyrene caused reproductive difficulties in mice and their offspring. These offspring also exhibited birth defects and decreased body weight. Animal studies with other PAHs produced a variety of health effects, including adverse effects to skin, body fluids, and the immune system (2).

Other carcinogenic PAHs found at Lenz Oil include benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(cd)pyrene. Studies indicate they were carcinogenic to animals when ingested, through skin contact, or inhaled. All of the listed PAHs are listed as B2 carcinogens by USEPA. No carcinogenic comparison values were available for any of these PAHs (2).

Polychlorinated Biphenyls (PCBs)

PCBs were detected in the nonaqueous liquid, in on-site groundwater, and in on-site soils. Exposure to PCBs in and around the site would be by inhalation, ingestion, and dermal contact. The amount of absorption by each route is not known in humans. Since absorbed PCBs are distributed to fat, the fat in breast milk is a source of exposure in infants. PCBs may be transferred from the mother to the fetus through the placenta (2).

The health effects of PCB exposure in humans may include chloracne and possible learning difficulties in children whose mothers were exposed during pregnancy. Health effects associated with PCB exposures in animals include liver, stomach, and thyroid gland effects, anemia, acne, and reproductive system damage. The effects have been seen in offspring of animals exposed to PCBs. There is limited evidence that PCBs are a liver carcinogen in animals (2).

The exposure to PCBs from either soil or groundwater would not be expected to cause chloracne in either trespassers or nearby residents. The health effects that have been seen in animals have not been observed in humans. PCBs are considered to be a probable human carcinogen by USEPA. PCBs are no longer being manufactured; however those present in the environment are very long lasting (2).

INORGANIC CONTAMINANTS

Aluminum

This element was detected in all background and environmental soil samples. Aluminum is the most concentrated element in soils following oxygen and silicon. Naturally occurring concentrations in soils have been reported as high as 300,000 ppm. Aluminum has been found in all environmental media analyzed at this site. USEPA has proposed a Secondary Maximum Contaminant Level (SMCL) of 50 ppb for drinking water. An SMCL is not determined by any adverse health effects but is set for taste and aesthetic purposes (2).

Few adverse health effects have been attributed to aluminum exposure, and no health guideline values have been established. Some occupational inhalation exposures have contributed to worker respiratory disorders. However, inhalation exposures to these high air concentrations are unlikely at this site. Ingested elemental aluminum is not well absorbed (2).

Arsenic

Arsenic has been detected in samples from both on- and off-site monitoring wells, one up gradient background well, on-site soils, and north ditch sediments. No arsenic was detected in residential wells. There is mounting evidence from human and animal data that arsenic causes cancer by the oral route and is considered by USEPA to be a known human carcinogen by the inhalation route. Inhalation may produce lung cancer, respiratory irritation, nausea, and skin problems. USEPA has not calculated a cancer slope factor by which to estimate the increased risk of developing cancer from arsenic exposure. ATSDR has developed a chronic oral MRL of 0.0003 mg/kg/day for ingestion of inorganic arsenic but has not developed an acute or intermediate oral MRL. Since the arsenic levels of concern were in on-site soil, chronic exposure is unlikely. If soil is ingested at low concentrations over an extended period of time, the non-carcinogenic effects that may be associated with inorganic arsenic exposure include irritation of the stomach and intestines with symptoms including nausea, vomiting, diarrhea, a decrease in the production of red and white blood cells, abnormal heart function, blood vessel damage, and impaired nerve function causing a "pins and needles" sensation in the hands and feet (2).

Long-term ingestion may also lead to a pattern of skin changes, including a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso. These skin changes are not a health concern by themselves; however, they may later develop into skin cancer. Ingestion of arsenic has also been reported to increase the risk of liver, bladder, kidney, and lung cancers (2).

Barium

Barium was detected in most of the soil samples analyzed and frequently in groundwater and surface water samples. Exposure to site-related barium could occur through ingestion and inhalation of barium-contaminated media. Little is known about the health effects of low level, short-term exposure of humans to barium. Health effects of people with chronic exposure to barium include difficulties in breathing and increased blood pressure, changes in heart rhythm, stomach irritation, changes in blood, muscle weakness, changes in nerve reflexes, swelling of the brain, and damage to liver, kidney, heart, and spleen. However, daily exposure to on-site soils, sediment, and surface water is unlikely. No MRLs have been established for barium exposure (2).

Cadmium

This trace metal is naturally occurring in soils at levels ranging from 0.01 to 7 ppm. In soils that have been conditioned with sewage sludge or phosphate fertilizers, the concentration of cadmium would likely be on the higher end of the normal range. Unlike some heavy metals, cadmium is not an essential nutrient and has no known beneficial effect on human health. Workers breathing air with high levels of cadmium over a short time have experienced lung damage and death. Cadmium inhaled over a longer period has been linked to skeletal disorders and lung cancer. However, most cadmium levels encountered in the environment are not high enough to cause this effect. Lower levels inhaled or ingested over a long period result in an accumulation of cadmium in the kidneys and liver and may lead to kidney disorders. In laboratory animals, exposure to cadmium has also resulted in adverse pregnancy outcome and other cancers (2).

The population exposed to cadmium would be the same as for the other inorganic compounds. Exposure would occur by ingestion and inhalation of contaminated soil and inhalation of fugitive dusts from the site. The data on cadmium inhalation and cancer in humans is limited. No current air data exist for this site.

Non-carcinogenic health effects that may be associated with oral cadmium exposure are a build-up of cadmium in the kidney, which may cause kidney damage, and fragile bones. The chronic oral MRL for cadmium is 0.0007 mg/kg/day (2). Cadmium concentrations of 0.4 ppm for a pica child (a child who regularly eats nonfood items such as dirt), 10 ppm for a child, and 140 ppm for an adult are estimated to result in a daily exposure equal to 0.0002 mg/kg/day, which is below the levels associated with non-cancer, adverse health effects.

Chromium

Chromium is a metal that exists in several forms in the environment including chromium III and chromium VI. Chromium III is the naturally occurring form and is an essential nutrient. Chromium VI is usually associated with industrial activities. Chromium analysis in both air and soil samples did not differentiate between chromium III and chromium VI (2).

No adverse health effects associated with chromium exposure through ingestion or inhalation of fugitive dust or on-site soils would be expected at this site at the levels detected; however, allergic individuals may have redness and swelling of skin if they contact the chromium (2).

Long-term exposure to elevated chromium levels in the work place have been associated with lung cancer. Chromium VI seems to be at least one form of chromium associated with lung cancer, but chromium III has not been associated with cancer (2).

Lead

Lead is a metal found naturally in soil. It has no beneficial biological function once absorbed into the human body. It is especially harmful to developing nervous systems in unborn babies and small children. Lead effects on nervous system development were recognized early in this century but were assumed to be reversible until the 1940s when researchers reported permanent effects on learning and behavior in children exposed to lead (2).

Lead has been found at the Lenz Oil site in the nonaqueous liquid, the groundwater, and the soil. Although it is not appreciably absorbed through the skin, oral and inhalation exposure remains a concern. ATSDR has no MRLs and USEPA has no RfDs for lead; however the Centers for Disease Control lowered the acceptable blood lead levels. Because it has been linked to central nervous system disorders in young children, ATSDR and IDPH recommend that environmental lead exposures be limited to those that do not result in blood lead levels more than 10 micrograms of lead per deciliter of blood (2).

Most of the health effects associated with lead are the result of chronic low-level exposures. Acute adverse effects of lead intoxication are similar to chronic effects but occur rarely. Acute effects can be severe and include mental retardation and death. Chronic effects of lead intoxication vary depending on exposure levels. Some health effects attributed to lead exposure are interference with Vitamin D production, neurobehavioral toxicity, renal dysfunction, and at higher exposures, dysfunction of cardiovascular, hepatic, gastrointestinal, and endocrine systems (2).

The population affected by the site would include workers on site and residents in areas surrounding the site. On-site workers and adjacent populations could be exposed by both inhalation and ingestion. Inhalation of lead would occur by breathing suspended contaminated dirt and waste pile particles. Workers could accidentally ingest lead if they do not wash contaminated soil from their hands before they smoke or eat; inadvertent ingestion may have also occurred indirectly through inhalation contaminated dust and swallowing what did not get into lungs.

Currently, no comparison values have been developed for lead except the MCL action level (15 ppb) for community drinking water supplies. The concentration of lead found in eight on-site monitoring wells exceeded this MCL; however, these wells are not being used for drinking water.

Manganese

All site soil, sediment, and groundwater samples analyzed contained manganese. Manganese can be absorbed after ingestion or inhalation, but only 3 to 5 percent of ingested manganese is absorbed. The amount absorbed after inhalation is not known. Scientists believe the small amounts consumed by people in a typical diet are important to their health, but high concentrations can be harmful (2). Children who consume groundwater from the on-site shallow wells with the highest manganese concentrations would not receive a dose that exceeds the USEPA oral RfD for drinking water. The health effects associated with the ingestion of manganese may include weakness, stiff muscles, and trembling of hands. It is not known to cause cancer if ingested (2). Daily ingestion or inhalation of manganese from site soils, sediments, and groundwater is unlikely. Therefore, no adverse health effects are expected if people are exposed to manganese at the site.

Nickel

Nickel was detected at levels above comparison values in on-site monitoring wells and in on-site soils but below comparison values in off-site wells and soils. This element can be absorbed after ingestion or inhalation, and a small amount can be absorbed after dermal contact. Most ingested nickel is not absorbed but is eliminated in the feces. After absorption, most nickel is transported to the kidneys and is eliminated in the urine. Nickel in the form of refinery dust and the sulfide compounds are known human carcinogens by inhalation; however, in these occupational exposures the employees were exposed to nickel levels much higher than those on site. Only a few soil samples exceeded the comparison value. No air data for nickel exist for this site. In some individuals who are sensitive to nickel, skin contact with nickel may cause a skin rash (2).

Selenium

Although selenium was below detection limits in most of the samples analyzed, it was found in the north drainage ditch sediment and in the nonaqueous liquid samples at levels above comparison values. Selenium is an essential nutrient. The effects of selenium inhalation in humans are not known. Ingestion of selenium at concentrations above those necessary for the nutritional requirements can cause brittle hair, deformed nails, and in extreme cases numbness and incoordination of the limbs (2). Other than the few samples listed in this document , the environmental samples did not exceed comparison values. No adverse health effects are expected to occur if people do sometimes come into contact with selenium at the site.

Zinc

No comparison values could be found for zinc concentrations in soil or air. The nonaqueous liquid contains a high concentration of zinc. Zinc is an essential nutrient. The health effects associated with zinc are non-carcinogenic. The health effects from breathing high levels of zinc in the work place include breathing difficulties and may cause a brief sickness called metal fume fever. At very high levels, breathing zinc dust or fumes may be life threatening. Ingestion of too much zinc can cause anemia and digestive problems. Excessive zinc intake may also be associated with an increased risk of heart disease and trouble in fighting disease or infection (2). None of these health effects due to zinc exposure would be expected at this site.

B. Health Outcome Data Evaluation

People living in the small neighborhood community south of the site were likely exposed to site-related contamination until municipal water was made available in 1988. This small population, however, would not be large enough to provide any statistically significant data on whether any adverse health effects were caused by exposure or occurred by chance. Therefore, no health outcome data have been generated or analyzed. There have been no reports of excessive cancer from residents who may have previously been exposed to site-related contamination in their drinking water. One resident living up gradient of the site reported that her son was diagnosed with cancer.

C. Community Health Concerns Evaluation

Question 1: What health effects are associated with chlorinated solvents?

Response: There are some chlorinated solvents associated with adverse health effects following long-term exposures. For example, methylene chloride is a chlorinated solvent that is a possible human pancreatic or liver carcinogen. Other chronic effects following methylene chloride exposure may include cardiovascular disorders (arrhythmia) or increased liver enzymes.

Question 2: Will wells on top of the bluffs become contaminated?

Response: There is a potential for the contaminated groundwater to continue to move further off-site to the south. At this time, we believe the wells on the bluff north of the site are naturally protected because they are up gradient from the site and the groundwater flows in the opposite direction. In December of 1990, IDPH collected a sample of well water from a residence where the resident was concerned about potential contamination of the well and who was experiencing skin rashes. The well in question was north of the site on top of the bluff. The well sample was thoroughly analyzed for all site-related chemicals known to cause skin rashes. The sample analysis did not detect any chemicals at levels above the detection limits of the laboratory equipment. We conclude that the private wells in this neighborhood north of the site are geologically protected from well contamination.

CONCLUSIONS

The Lenz Oil Service site near Lemont, Illinois, poses no apparent public health hazard because there is no human exposure to contaminants at levels of health concern at this time. Before the availability of a community water supply in 1988, some residents using private wells may have been exposed to low-level concentrations of groundwater contaminants. Presently, there are no known exposures to the residual surface soil contamination found at the site. Although much of the hazardous waste was removed or incinerated, groundwater continues to be contaminated by remaining subsoil contamination and by a nonaqueous layer of contaminants floating on the groundwater. In the future, the contaminated groundwater could pose a health threat due to its potential for continued down gradient migration to other private wells still used for drinking water.

Some gaps are in the fences, and people can enter the site.

RECOMMENDATIONS

Cease/Reduce Exposure Recommendations

1. Properly seal all private wells located within the contaminant plume.

2. Disallow applications for permits to drill new wells into the contaminated aquifer until groundwater remediation is completed.

3. Secure the site; gaps exist in present wood, wire, and cyclone types of fencing.

4. Maintain a good vegetative ground cover on site to help reduce contaminant migration and possible exposure.

Site Characterization Recommendations

1. Continue the groundwater monitoring program to augment the data which currently exist. This additional data could better characterize the movement of groundwater contamination off site and provide current levels of contamination to address potential adverse health effects to those individuals who may be exposed.

2. Provide additional contaminant concentration information collected during future groundwater and soil cleanup to IDPH for consideration.

Public Health Actions

The Public Health Action Plan (PHAP) for the Lenz Oil Service, Inc., site contains a description of actions to be taken by ATSDR or IDPH at and near the site subsequent to the completion of this public health assessment. The purpose of the PHAP is to ensure that this public health assessment not only identifies public health hazards, but also provides a plan of action designed to mitigate and prevent adverse health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of ATSDR and IDPH to follow-up on this plan to ensure that it is implemented.

ATSDR and IDPH will coordinate with the state and federal environmental agencies to carry out the recommendations made in this assessment. No other public health actions have been identified as necessary at this time. ATSDR and IDPH will re-evaluate and expand the PHAP when needed. New environmental, toxicological, or health outcome data, or the results of implementing the proposed actions and recommendations may determine the need for additional actions at this site.

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CERTIFICATION

This Lenz Oil Service Public Health Assessment was prepared by the Illinois Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health assessment and concurs with its findings.

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APPENDICES

APPENDIX A - Tables 1-15

Table 1: Waste Materials Accepted by Lenz Oil
Table 2: Organic Groundwater Contaminants
Table 3: Inorganic Groundwater Contaminants
Table 4: Volatile Organic Soil Contaminants
Table 5: Semivolatile Organic and PCB Soil Contaminants
Table 6: Inorganic On-Site Soil Contaminants
Table 7: Inorganic Surface Water Contaminants
Table 8: Organic Contaminants of Concern
Table 9: Inorganic Contaminants of Concern
Table 10: Soil Gas Investigation
Table 11: Off-Site Air Monitoring
Table 12: USEPA TRI Data
Table 13: On-Site Soil Contaminants Before and After Incineration
Table 14: Completed Exposure Pathways
Table 15: Potential Exposure Pathways

Table 1

WASTE AND NONWASTE STORAGE SUMMARY
LENZ OIL SERVICE INC.

Waste Materials Accepted

Waste Oils	Spent Solvents
Motor oil	Oxygenated solvents
Hydraulic oil	Methyl ethyl ketone
Cutting oil	Toluol/Toluene
Lubricating oil	Ethanol
Transformer oil	Hexane
	Heptane
Other Wastes	Acetate
	Alcohol
Pigments	Zylol/Xylene
Inks	Butanol
Kerosene	Ethyl acetate
Aliphatic hydrocarbons (nonspecific)	Aromatic naptha
Aromatic hydrocarbons (nonspecific)	Aliphatic naptha
Petroleum hydrocarbons (nonspecific)	1,1,1-Trichloroethane
Chlorinated hydrocarbons (nonspecific)	Acetone
	Naptha
	Trichloroethene
	Methylene chloride

Nonwaste Materials Stored

Asphalt	Diesel Fuel	Gasoline

Source: Environmental Resources Management-North Central, Inc.
Remedial Investigation Report, Revision 1, October 16, 1992

Table 2. LENZ OIL ORGANIC GROUNDWATER CONTAMINANTS (in ppb).

Contaminant	NONAQUEOUS LAYER ON-SITE		SHALLOW WELLS				INTERMEDIATE WELLS		DEEP WELLS			Comparison Value	Source
	WELL G106L	WELL MW5S	ON SITE WELLS		OFF-SITE WELLS		ON-SITE WELLS	OFF-SITE WELLS	UP GRADIENT	FIVE ON SITE WELLS	THREE OFF SITE WELLS		
			n = 7	range	n = 3	range	N = 1 G104D	N = 2					
Benzene	ND	ND	1	340J	ND		ND	ND	NT	10	NT	1	CPEG
Toluene	64,000J	ND	ND	-	ND	-	ND	ND	NT	4J	NT	200	[illegible]
Ethylbenzene	320,000	45,000J	ND	-	ND	-	ND	ND	NT	NT	NT	700	[illegible]
Xylenes	1,700,000	180,000J	ND	-	ND		ND	ND	NT	NT	NT	2,000	[illegible]
Chloroethane	ND	ND	1	100J	1	4J	ND	5J	NT	5J	NT	NONE	
Vinyl chloride	ND	ND	ND	-	1	11J	ND	15J	NT	NT	NT	0.2	[illegible]
1,1 Dichloroethane	ND	ND	4	2J 28J	1	60	1	4J	NT	NT	NT	NONE	
1,2 Dichloroethane	ND	ND	1	3J	ND	-	ND	ND	NT	NT	NT	0.4	CPEG
1,1 Dichloroethene	ND	ND	1	5J	1	5	ND	3J	2J	NT	2J	0.06	CPEG
Trichloroethene	ND	ND	1	2J	1	6	ND	3J	NT	NT	NT	3	CPEG
Carbon tetrachloride	ND	ND	ND	-	ND	-	ND	ND	3J	NT	3J	0.3	CPEG
Tetrachloroethene	ND	ND	ND	-	1	2J 3J	ND	ND	2J	NT	2J	0.7	CPEG
Naphthalene	210,000J	150,000J	2	460J 800J	ND		ND	ND	NT	NT	NT	20	[illegible]
2 Methylnaphthalene	1,300,000	1,000,000	2	1,800-4,000	ND	-	ND	ND	NT	NT	NT	NONE	
Fluorene	100,000	120,000J	2	120J 420J	ND	-	ND	ND	NT	NT	NT	300	[illegible]
n Nitrosodiphenylamine	250,000J	ND	ND	-	ND	-	ND	ND	NT	NT	NT	7	CPEG

Contaminant	NONAQUEOUS LAYER ON-SITE		SHALLOW WELLS				INTERMEDIATE WELLS		DEEP WELLS			Comparison Value	[illegible]
	WELL G106L	WELL MW55	ON-SITE WELLS		OFF SITE WELLS		ON-SITE WELLS	OFF-SITE WELLS	UP GRADIENT	FIVE ON-SITE WELLS	THREE OFF SITE WELLS		
			n=7	range	n=3	range	N=1 G104D	N=2					
Phenanthrene	250,000J	27,000	3	2J-1,000J	ND	-	ND	ND	NT	NT	NT	NONE	
Acenaphthene	58,000J	ND	1	72J	ND	-	ND	ND	NT	NT	NT	[illegible]	[illegible]
2,4-Dinitrotoluene	66,000J	ND	ND	-	ND	-	ND	ND	NT	NT	NT	20	CLMEG [illegible]
Aroclor-1242	30,000J	19,000J	2	56-160	ND	-	ND	ND	NT	NT	NT	[illegible]	RMEG [illegible] (child)
Aroclor-1260	22,000J	17,000J	2	51-97J	ND	-	ND	ND	NT	NT	NT	0.7	RMEG [illegible] (child)

Table 2. LENZ OIL ORGANIC GROUNDWATER CONTAMINANTS (in ppb).

ppb = parts per billion (or micrograms of contaminant per liter of sample).
ND = not detected
J = estimated value
- = not applicable
NT = not tested or sample was unusable

Table 3. **LENZ OIL INORGANIC GROUNDWATER CONTAMINANTS (in ppb).**

Contaminant	NONAQUEOUS LAYER ON-SITE WELLS		SHALLOW WELLS ON-SITE		SHALLOW WELLS OFF SITE		OFF SITE Intermediate Wells		DEEP WELLS ON-SITE		DEEP WELLS OFF-SITE		Drinking water comparison values		UPGRADIENT BACKGROUND WELLS		
	C106L	MW5S	n=6	range	n=3	range	MW7S	G102D	n=5	range	n=3	range	value	source	G101 D	G101M	G101 L
Aluminum	21,400	17,100	6	3,320-68,700J	3	1,730J-11,400	5,200J	434J	5	233J-4,940J	3	371-1,280	NONE		731J	22,700J	940J
Antimony	NT	NT	NT	-	NT	-	NT	NT	1	13.7J	NT	-	4	RMEG child	NT	NT	NT
Arsenic	1,900	5,800	6	8.5J-92	3	7.7J-41.7J	6.9J	10.7J	3	3J-5.1J	3	2.1J-5.4J	3	CEMEG child	NT	3.3J	NT
Barium	146,000	219,000	6	115-1,410J	3	43.7-81.5J	123J	51.8	5	32-117	3	30.7-46.6	700	RMEG child	28.4	[illegible]	23.1
Cadmium	11,200	NT	1	1.6J	1	1.1J	NT	NT	NT	-	NT		5	RMEG child	NT	ND	NT
Chromium	5,700	4,600J	6	25.7J-117J	3	13.2J-32.1	17.1	42.2	2	4J-7.2J	2	5.5-6.6	50 (VI)	RMEG child	NT	38.9J	NT
Copper	NT	2,200	6	12.4J-212J	3	12.4-102	16.6J	9.2	4	3.2-16J	2	3.7-4	1,300	MCL	3.4	82.9J	NT
Lead	107,000	127,000J	6	55.4-564	2	26.3-31	NT	NT	NT	-	NT	-	15	MCL	NT	5	NT
Manganese	1,400J	2,300J	6	167-4,650	3	362-614	452J	182	5	86-263	3	57.9-206	50	RMEG child	39.7	2,010	42.4
Mercury	NT	NT	2	.31J-.57J	1	.24J	NT	NT	NT	-	NT	-	NONE	-	NT	ND	NT
Nickel	2,100J	1,300J	6	19.6-164J	3	14.9-50.7	20.4J	15.8	4	4.3-14.9	2	4.7-5	100	LTHA/ MCL	NT	76.3J	NT
Selenium	180J	370J	NT		NT	-	NT	NT	NT	-	NT	-	20	CEMEG child	NT	NT	NT
Vanadium	4,300J	810J	6	13-130J	2	15.4-22.1	NT	NT	NT	-	1	3.5	30	IMEG child	NT	45.4J	NT
Zinc	7,100J	3,300J	6	25.3J-386J	2	44.6J-99.5	48J	NT	NT	-	1	21.9J	2,000	LTHA	NT	268J	NT

ppb - parts per billion
ND - not detected
J - estimated value
\- not applicable
NT - not tested or sample was unusable

not tested or sample was unusable

Table 4. LENZ OIL VOLATILE ORGANIC SOIL CONTAMINANTS (in ppm).

Contaminants	Shallow Borings - area not excavated		Deep Bores		Phase II Bores		Drainage Ditch Surface Soil		Ditch Sediments	Comparison Values(a)	Source
	n=14	range	n=15	range	n=38	range	n=12	range	n=6		
Benzene	4	0.008 0.15J	7	0.010-0.039	4	0.004 0.13	ND		ND	20	CREG
Ethylbenzene	6	0.008 0.041	6	0.008 1.0	13	0.008J-11.0	1	0.012	ND	5,000	RMEG
Xylenes	4	0.074J 0.39	5	0.041-7.5	16	0.004J 42.0	1	0.07	ND	10,000	RMEG
Toluene	6	0.004J 0.081	4	0.01-4.0	20	0.002J-.05	1	0.011	ND	1,000	IEMEG
1,1,1-Trichloroethane	3	0.003J-0.007	4	0.003J-0.16	26	0.004J 0.12	ND		ND	NONE	NONE
Trichloroethene	6	0.003J 0.22J	3	0.38-0.91	6	0.004J-.011J	1	0.02J	ND	60	CREG
Tetrachloroethene	9	0.002J-0.28J	5	0.007-2.8	7	0.006J 0.23J	1	0.041J	ND	10	CREG

(a) = values are for child
ppm = parts per million
ND = not detected
J = estimated value

Table 5. LENZ OIL SEMIVOLATILE ORGANIC and PCB SOIL CONTAMINANTS (in ppm).

Contaminant	Phase I Shallow Bores		Phase I Deep Bores		Phase II Bores Resampled (PCBS Phase I & II)		Phase II Shallow Bores - outside excavated area		Phase II Deep Soil Bores - outside excavated area		Surface Soil Drainage Ditch		Sediments		Comparison Value*	Source
	n=15	range	n=14	range	n=18	range	n=11	range	n=9	range	n=12	range	n=8	range		
Anthracene	7	0 065J-1 2J	4	0 079J 0 47J	6	0 031J-2 2J	3	0 11J 0 67J	3	0 16J-1 7J	7	0 049J-0 49J	5	0 061J 2 6	600/20 000	RMEG
Naphthalene	5	0 048J 0 240J	6	0 053J-5 2	3	0 067J-10 0	1	2 1	1	0 63J	2	0 09J 0 099J	ND	-	NONE	-
Acenaphthene	4	0 11J 0 27J	3	0 11J-0 21J	4	0 084J-1 2J	1	0 15J	3	0 056J-1 1J	2	0 099J-0 1J	ND		100/3 000	RMEG
2 Methylnaphthalene	7	0 061J-0 64	6	0 097J 45 0J	9	0 07J-34 0	2	0 2-2 1	1	0 6J	2	0 17J-0 19J	1	0 46J	NONE	-
Dibenzofuran	3	0 07J-0 17J	4	0 065J-1 1J	1	0 85J	2	0 044J-0 83J	1	0 83J	3	0 071J-0 1J	ND	-	NONE	-
Fluorene	3	0 11J 0 37J	3	0 12J-2 5J	3	0 081J-1 4J	ND	-	2	0 081J-1 4J	2	0 096J 0 13J	ND	-	80/2 000	RMEG
Phenanthrene	14	0 077J 2 9J	6	0 13J-3 9	10	0 19J-9 2	4	0 41-2 6	4	0 89-7 3	12	0 13J-1 8J	8	0 4J 12 0	200/6 000	RMEG
Di-n-butyl phthalate	ND	-	NT	-	3	0 043J-0 44J	1	0 42J	1	0 28J	ND	-	ND	-	NONE	
Benzo(a)anthracene	8	0 21J 5 0	3	0 17J-0 34J	4	0 077J-4 9	2	0 2J 1 8J	4	0 42-2 7	9	0 32J-1 3J	6	0 45J 3 8	NONE	
Chrysene	13	0 072J 5 7	2	0 23J 0 48	8	0 098J 4 3	3	0 22J-1 8J	4	0 35J-2 8	12	0 41J 1 8J	6	0 84 3 2	NONE	
Benzo(b)Fluoranthene	6	0 2J 5 5	2	0 18J 0 31J	4	32J 6 2J	2	0 12J 3 3	4	0 54 4 7	11	0 45J 1 8J	6	0 74 2 8	NONE	
Benzo(k)Fluoranthene	6	0 18J 3 0	2	0 11J 0 21J	2	0 18J 3 0J	1	0 18J	1	0 2J	10	0 28J 1 3J	6	0 84 2 1	NONE	
Benzo(a)Pyrene	5	0 098J 4 5	3	0 15J 0 32J	1	4 4J	1	1 7J	4	0 35J-2 3	11	0 28-1 6	6	0 81 2 7	0 1	[illegible]
Indeno(1,2,3-cd)Pyrene	5	0 58 3 2	1	0 81J	NT	-	1	0 18J	2	0 28J 0 28J	11	0 23J-1 5J	6	0 54 1 7	NONE	-
Benzo(g,h,i)Perylene	5	0 21J 2 8	2	0 082J 0 17	NT	-	ND	-	1	0 28J	11	0 21J-1 6	6	0 52 1 5	NONE	
Aroclor 1242	ND	-	ND	-	17	0 065-12 0	ND	-	ND	-	ND	-	ND	-	0 01/3	RMEG (1016)
Aroclor 1248	ND	-	ND		2	0 84 5 5	ND	-	ND	-	ND	-	ND	-	0 01/3	RMEG (1016)
Aroclor 1254	ND	-	ND	-	9	0 20 9 3	ND	-	ND	-	ND	-	ND	-	0 04 1	RMEG
Aroclor 1260	ND		ND		8	0 08 1 3	ND	-	ND	-	ND	-	ND		[illegible]	RMEG (1016)

[illegible]
* [illegible]
[illegible]
[illegible]
[illegible]
NT [illegible] sample was unsafe [illegible]

Table 6. LENZ OIL INORGANIC ON-SITE SOIL CONTAMINANTS (In ppm).

Detected Contaminant	Figure 4-5A Phase I Shallow Bores Table 4-16	Figure 4-5B Phase I Shallow Bores Table 4-16	Figure 4-5C Phase I Deep Bores Table 4-18	Figure 4-5D Phase II Shallow Bores Table 4-19	Figure 4-5E Phase II Deep Bores Table 4-19	Figure 4-6A Surface Soils Samples Table 4-20	Figure 4-6B North Ditch Sediments Table 4-27	Comparison Values for Children	Source
	n = 17 range	n = 10 range	n = 13 range	n = 21 range	n = 16 range	n = 12 range	n = 6 range		
Aluminum	9710J-20400	9490J 50,000J	1230-23,400J	3,610-21,200	951-16,800	2180-18,800	6540-36,100	NONE	
Antimony	5N 12R	17.3J one N 8R	63.5J 4N 8R	21-Ns	16N	8.5-44.5	1.8 11.3 4 Ns	[illegible]	[illegible]
Arsenic	3.2J-12.1J	1.1J-19.0J	9.7J-87.4J	2.6-14.4J	4.2-13.2J	4.7J-79.6	4.7J-18.4J	0.5	CREG
Barium	57.4J-1280	59.1J 3060J	6.6J-412	40.3J-882.0J	70.1-493J	14.2-512.0	73.3-136	4,000	RMEG
Cadmium	1.0J-2.6J	1.4J-2.0J	0.97J-1.3J	1.7-1.9	3.8 15-Ns	12R	6R	40	CEMEG
Chromium (total)	31.8J-90.9J	31.3J-65.2J	6.1J-64.9J	7.9-40.5J	4.1-98.1J	1.3-158	33.8-60.8	300	RMEG
Cobalt	11.9-22.8	5.1-21.6	6.8-28.4	21R	14.6 15R	10.4-31.2	12.2-32.2	NONE	
Copper	18.9-670J	7.0J-234J	3.0J-167J	12.0-268.0J	8J-120J	54.5J-546J	69.1-154J	NONE	
Iron	16300J-38400J	17,800 57,200	11,900-53,000	6,750-27,600	6,650J-113,000J	4,230J-33,400J	13400J 30100J	NONE	-
Lead	87.3J-909J	102J-685J	4.0-561J	13.1-714.0	8 2J-498	75.5J-620J	65.6J-320J	NONE	
Manganese	266-1590J	352-683J	270-691J	233J-1,110J	117J-445J	123J-1,130J	612J 816J	7,000	RMEG
Mercury	0.09-0.5J	0.13	0.08J-0.25J	0.12-0.79	0.11-0.38	0.11-0.42	0.2-0.26J	NONE	-
Nickel	9.5J-47.5	26.2-28.7J	17.5-34.5	9.7-34.2	10.1-34.7	4.8-69.3	6.6-32.9	1,000	RMEG
Selenium	0.55J-0.73J	1.8J	0.25J-2.8J	NT	NT	0.61J-1.5J	3.2-5.7J	100	CEMEG
Vanadium	20.0-43.4	21.9-77.7	4.6-94.2	11.2-38.4	11.5 27.8	22.2-35.1	22.3 28.9	200	[illegible]
Zinc	61.9-639	62.2J-491J	12.5J-308	34.9-376	16.5-490J	29.7J-654J	116J 284J	20,000	RMEG
Cyanide	0.33-7.7	0.6-7.7	1.7-12.0	NT	8.3J	0.22J-0.73J	0.461	1,000	RMEG

ppm = parts per million
J = estimated value
N = nondetected value
R = analyses was rejected
- = not applicable
NT = not tested or sample was not usable

Table 7. LENZ OIL INORGANIC SURFACE WATER (NORTH DRAINAGE DITCH) CONTAMINANTS (In ppb).

Contaminant (Laboratory Detection Limits)	Sample Values			Drinking Water Comparison Values	
	Detected Values	# of Nondetects	# of Rejects	Value	Source
Aluminum	2890.0 8610.0 8850.0 24700.0 36100.0	0	1	NONE	
Antimony (31.0)	0	6	0	4	Child RMEG
Arsenic (8.0)	0	6	0	3	Child CEMEG
Barium	241.0 991.0	0	4	700	Child RMEG
Beryllium (1.0)	0	4	2	4	MCL
Cadmium (1.0)	20.0	5	0	5	Child RMEG
Chromium (2.0)	12.2 14.8 41.0 73.6	1	1	2	CLHA
Cobalt (3.0)	0	1	5	NONE	-
Copper (6.4)	30.9 48.4 79.0 208.0	1	1	1300	MCL*
Lead (2.0)	2.1J 2.2J	4	0	15	MCL*
Manganese	123.0 352.0 407.0 700.0 2160.0 9290.0	0	0	50	Child RMEG
Mercury (0.2)	0	6	0	NONE	-
Nickel	45.1 94.9	0	4	100	MCL
Selenium (3.0)	0	6	0	20	Child CEMEG
Silver (5.0)	0	5	1	50	Child RMEG
Thallium (5.0)	0	6	0	2	MCL
Vanadium (3.0)	57.5	1	4	30	Child IEMEG
Zinc	21.2 93.4 163.0 170.0 432.0 2460.0	0	0	2000	LTHA
Cyanide (10.0)	0	6	0	2	CLHA

ppb = Parts per billion (or micrograms per liter).
CHLA = Child Longer Term Health Advisory for drinking water (EPA).
MCL* = USEPA drinking water "action level" for public water supplies
J = Estimated value.
- = not applicable

Table 8. LENZ OIL ORGANIC CONTAMINANTS OF CONCERN.

CONTAMINANT	NONAQUEOUS LAYER	MONITORING WELLS							SOIL	SAMPLES FROM NORTH DRAINAGE DITCH		
		Shallow		Intermediate		Deep			Borings			
		On Site	Off-Site	On-Site	Off-Site	Background	On Site	Off-Site	On-Site	Surface Water	Surface Soil	Sediments
Benzene		X					X		15B			
Toluene	X						B		30B		B	
Ethylbenzene	XX								25B		B	
Xylenes	XX								25B		B	
Chloroethane		D	D		D		D					
Vinyl chloride			X		X							
1,1-Dichloroethane		DDDD	D	D	D				9D			
1,2-Dichloroethane *		X							BBB			
1,1-Dichloroethene		X	X		X	X		X				
Trichloroethene *		B	X		X				15B		B	
1,1,1-Trichloroethane *			B		B	B		B	33D			
Carbon tetrachloride						X		X				
Tetrachloroethene			XX			X		X	21B		B	
Naphthalene	XX	XX							18D			
2-Methylnaphthalene	DD	DD							27D			D
Anthracene									30B			5B
Benzo(a)anthracene									30D			6D
Chrysene									42D			6D
Benzo(b)fluoranthene									20D			6D
Benzo(k)fluoranthene									22D			6D
Benzo(a)pyrene									25X			6X
Indeno(1,2,3-cd)pyrene									20D			6D

Table 8. LENZ OIL ORGANIC CONTAMINANTS OF CONCERN.

CONTAMINANT	NONAQUEOUS LAYER	MONITORING WELLS							SOIL	SAMPLES FROM NORTH DRAINAGE DITCH		
		Shallow		Intermediate		Deep			Borings			
		On Site	Off-Site	On-Site	Off-Site	Background	On-Site	Off-Site	On-Site	Surface Water	Surface Soil	Sediments
Benzo(g,h,i)perylene									20D			
Fluorene	XX	BX							13D			
Dibenzofuran		D							14D			
Phenanthrene	DD	DDD							56D			6D
Acenaphthene	X	B							17D			
2,4-Dinitrotoluene	X											
Di-n-Butylphthalate		D	D			D	D	D	5D			
Aroclor-1242	XX	XX										
Aroclor-1248									3X			
Aroclor-1254									10X			
Aroclor-1260	XX	XX										

KEY: X = ABOVE ENVIRONMENTAL MEDIA GUIDELINE
D = DETECTED BUT NO GUIDELINE ESTABLISHED
B = DETECTED BUT BELOW GUIDELINE
MULTIPLE DETECTIONS DEPICTED BY MULTIPLE LETTERS OR NUMBER PRECEDING LETTER
BLANK = NOT DETECTED
* = DETECTED IN SOIL GAS SURVEY

Table 9. LENZ OIL INORGANIC CONTAMINANTS OF CONCERN.

Contaminant	Nonaqueous Layer 2 samples	MONITORING WELLS					SOIL	SAMPLES FROM NORTH DRAINAGE DITCH		
		Shallow		Intermediate	Deep		77 Borings			
		6 On-Site	3 Off-Site	2 Off Site	5 On-Site	3 Off-Site	On Site	12 Surface Soils	6 Sediments	6 Surface Waters
Aluminum	DD	DDDDDD	DDD	2D	5D	DDD	77D	12D	6D	5D,1R
Antimony					1X		1X,1B,47N,28R	1X,2B	2B,4N	6N
Arsenic	XX	XXXXXX	XXX	2X	3X	XXB	67X,10N	10X,2N	3B,3N	6N
Barium	XX	XBBBBB	BBB	2B	5B	BBB	67B,10R	12B	6B	1X,1B,4R
Cadmium	X	B	B				20B,35N,22R	12R	6R	1X,5N
Chromium	XX	XXBBBB	BBB	BB	2B	BB	77B	12B	6B	4X,1N,1R
Cobalt							41D,36R	8D,4N	6D	1N,5R
Copper	X	BBBBBB	BBB	BB	4B	BB	72D,5N	12D	6D	4B,1N,1R
Lead	XX	XXXXXX	XX				77D	12D	6D	2D,4N
Manganese	BB	BBBBBB	BBB	BB	5B	BBB	77B	12B	6B	6X
Mercury		BB	B				26D,51N	5D	4D	6N
Nickel	XX	XBBBBB	BBB	BB	4B	BB	54B,19N,4R	12B	6B	2B,4R
Selenium	XX				X		7B,55N,15R	2B,10N	4B,1N,1R	6N
Vanadium	BB	BBBBBB	BB			B	64B,1N,12R	4B,8N	2B,4N	1X,1N,4R
Zinc	XX	BBBBBB	BB			B	77B	12B	6B	1X,5B
Cyanide							22B,47N,8R	6B,6N	1B,5N	6N

KEY: X = ABOVE COMPARISON VALUE (ENVIRONMENTAL MEDIA GUIDELINE FOR CHILD)
B = DETECTED BUT BELOW GUIDELINE
D = DETECTED BUT NO GUIDELINE ESTABLISHED
N = NOT DETECTED
R = SAMPLE REJECTED
BLANK = NOT TESTED

Table 10. SUMMARY OF LENZ OIL SOIL GAS INVESTIGATION IN (May 19, 1987).

Contaminant	Highest Concentration (ppm*)
1,1-Dichloroethane	444
Methylene chloride	108
Benzene	33
Xylenes	466
Toluene	690
Total hydrocarbons	9308 mg/m^3

Table 11. SUMMARY OF LENZ OIL OFF-SITE AIR SAMPLING OF VOCs (1987).

Sampling Date	Air Monitoring Location: Downwind 94th & Madison	Upwind Mt. Assisi	Chicago 160 N. LaSalle	Wind Direction/Speed
7/13-14	1.16 ppm[1]	1.58 ppm	1.35 ppm	NW 9 mph
7/14-15	1.17	1.05	0.97	W 6 mph
7/15-16	0.78	1.96	0.91	NE 8 mph
7/20-21	1.48	1.82	1.57	W 12 mph
7/21-22	0.97	1.58	1.75	SW 8 mph
7/24-25[2]	1.03	1.59	1.47	SW 6 mph
Average Concentration	1.10	1.50	1.34	

[1]ppm = parts per million
[2]Digging for trial burn, SW wind toward 94th & Madison

Table 12. **USEPA TOXIC CHEMICAL RELEASE INVENTORY (TRI) SUMMARY FOR LENZ OIL HAZARDOUS WASTE SITE (Values reported in estimated pounds released per year).**

Chemical Released	Medium	1987	1988	1989	1990	1991
Acetone	Air	6264	9210	10342	13447	6945
	Land				250	
Aluminum oxide	Air	320000	463600			
Ammonia	Air	7829	6271	14773	61165	2000
	Water	69080	45767	24445	11315	27000
	Land	250	1728	1074		
Benzene	Air	64000	80413	89828	70103	32700
	Water				28	27
	Land	250				
1,3-Butadiene	Air	50	41	15	17	1
Butyl acrylate	Air	500	500	500	500	500
Chlorine	Air	3550	250	3727	4300	6600
Chromium compounds	Air	900	265	65	59	38
	Water	680	475	675	514	610
	Land	220	6825	3377		
Cobalt compounds	Water	120				
	Land	250				
Cyclohexane	Air	16000	12842	8010	7768	2700
	Water					5
Dibutyl phthalate	Air	500	500	500	500	500
Dichloromethane	Air			750	750	1000
Ethyl acrylate	Air	500	500	500	500	500
Ethylbenzene	Air	20550	20804	20284	10442	4000
	Water	500	250		51	94
	Land	500				
Ethylene	Air	7750	8406	9144	9339	4200
Ethylene glycol	Air		185			
Ethylene oxide	Air	132599	97518			
Freon	Air	10550	12620	12420		

Chemical Released	Medium	1987	1988	1989	1990	1991
Glycol ethers	Air	500	500	500	500	500
Hydrochloric acid	Air	68700	65500	70000	80120	771453
	Land	2600	2600	2600	2600	
Hydrogen fluoride	Air	7700	7825	6800	7826	6700
	Water	250				
Lead compounds	Air	60			51	68
	Water	930	950	784	1028	980
	Land	130	759	374		
Methanol	Air	1838	2511	2281	2877	1463
Methylethylketone	Air	4350	4694	6550	6700	8480
Methylmethacrylate	Air	500	500	500	500	1000
Molybdenum trioxide	Water				1285	1200
Naphthalene	Air	18000	8070	7453	3049	1130
	Water				10	10
	Land	250		262		
Nickel compounds	Air	1850	750	750	159	210
	Water	580		490	642	610
	Land	250		142		
Nitric acid	Air	3850	3670	3650	3650	
	Land	390	390	250	250	
Phenol	Air	170	11972	3934	1331	1301
	Water	340	361	354	537	340
	Land	250	29	12		
Phosphoric acid	Air	1080	841	761	760	250
Propylene	Air	12750	750	8930	9451	3290
Propylene oxide	Air	998	700			
Sodium hydroxide	Air	250	250			
	Water	16011	16000			
	Land	630	630			
Sulfuric acid	Air	3420	1868	2300	2055	250
	Land	710	710	750	250	

Lenz Oil Service, Inc. Final Release

Chemical Released	Medium	1987	1988	1989	1990	1991
Styrene	Air	25336	25165	24265	24051	43255
	Water	250	250	250	250	250
	Land	6600	250		250	
Toluene	Air	20900	117619	139101		
Trichloroethylene	Air	19869	37466	26134	34000	15090
1,1,1-Trichloroethane	Air	158000	96200	156900	96199	15424
	Water				24	23
1,2,4 Trimethylbenzene	Air	5500	5486	468	3815	3410
	Water					5
	Land	250				
Xylene	Air	73000	82230	65400	34506	15052
	Water					5
Zinc	Air		500	750	505	505
	Water	250	250	250	10	5
	Land	250				

BLANK = NO REPORTED RELEASE TO THAT MEDIUM

Table 13. Maximum Concentrations of Identified Contaminants Detected in Lenz Oil On-Site Surface and Subsurface Soils Before and After Incineration.

Contaminant	Prior-Highest Concentration (ppm**)	Date	Reference	After-Highest* Concentration (ppm**)
Benzene	8.5	01/23/87	21	0.130
Xylenes	2000.0	01/23/87	21	42
Dimethylbenzene	680	01/23/87	21	
Toluene	890.0	01/23/87	21	10
Ethylbenzene	520.0	01/23/87	21	11
Ethylmethylbenzene	220	01/23/87	21	
Trimethylbenzene	150	01/23/87	21	
1,2-Dichlorobenzene	34.0	01/23/87	21	1.9
Chloroethane	0.21	10/29/85	23	
trans-1,2-Dichloroethene	80.0	01/23/87	21	1.1
1,1-Dichloroethane	68.0	10/29/85	23	0.15
Methylene chloride	22.0	01/23/87	21	0.96
1,1,1-Trichloroethane	22.1	10/29/85	23	0.16
Tetrachloroethene	15.3	10/29/85	23	2.8
Trichloroethene	0.005	10/29/85	23	0.91
trans-1,3-Dichloropropene				0.014
Acenaphthalene				1.2
Anthracene				2.2
Fluoranthene	200.0	01/23/87	21	13
Phenanthrene	170.0	01/23/87	21	9.1
Naphthalene	30.0	10/29/85	23	26
Methylnaphthalene	14	01/23/87	21	
2-Methylnaphthalene	65.0	10/29/85	23	45
Dimethylnaphthalene	15	01/23/87	21	
Trimethylnaphthalene	11	01/23/87	21	
Ethylnaphthalene	15	01/23/87	21	
Benzo (a) anthracene				4.9
Dibenzofuran				2.4
Fluorene				2.5
Pyrene				12
Polychlorinated Biphenyls	15.0	10/29/85	23	
Aroclor-1242				12
Aroclor-1254				9.3
Aroclor-1260				1.3

Table 13 (continued)

Contaminant	Prior-Highest Concentration (ppm**)	Date	Reference	After-Highest* Concentration (ppm**)
Butylbenzylphthalate				3.2
Bis (2-ethylhexyl) phthalate				7.4
Chrysene				5.7
Benzo (b) fluoranthene				6.2
Benzo (K) fluoranthene				3.9
Benzo (a) pyrene				4.5
Benzo (g,h,i) perylene				2.6
Indeno (1,2,3,c,d) pyrene				3.2
Isophorone				3.5
gamma-BHC				0.0075
gamma-Chlordane				0.0024
Aldrin				0.018
DDE				0.053
DDD				0.26
DDT				0.38
Di-n-butylphthalate				0.42
Phenol				5.2
2,4-Dimethylphenol				0.57
Chloroform				0.006
Acetone				1.6
2-Butanone				0.36
Carbon disulfide				0.11
Beryllium				1.0
Cadmium				3.8
Chromium (total)				98.1
Cobalt				28.4
Copper				670
Lead	890.0	1/23/87	21	909
Magnesium				104,000
Zinc				639

* = From Feasibility Study Report, November, 1992, ERM-North Central, Inc.
ppm** = parts per million

Table 14. Lenz Oil Completed Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATIONS	TIME
Site Wastes	Collected Wastes	Contaminated Soil	Daily operations	Inhalation/Direct Contact	Workers	Past
			Fugitive dusts and/or fumes onto neighboring properties Tracking of wastes on roads	Inhalation	Downwind residents	Past Present
Groundwater	Surface Waste Contaminated soil	Groundwater	Use of contaminated well water	Ingestion/Inhalation	Residents with downgradient private wells	Past
				Inhalation	Residents using wells for nonpotable purposes	Present
Surface Water	Surface wastes Contaminated soil Groundwater discharge	Surface Runoff Surface water	Northern drainageway Des Plaines River	Inhalation/Direct Contact/Ingestion	Individuals using surface water for recreation or drinking water	Past Present Future

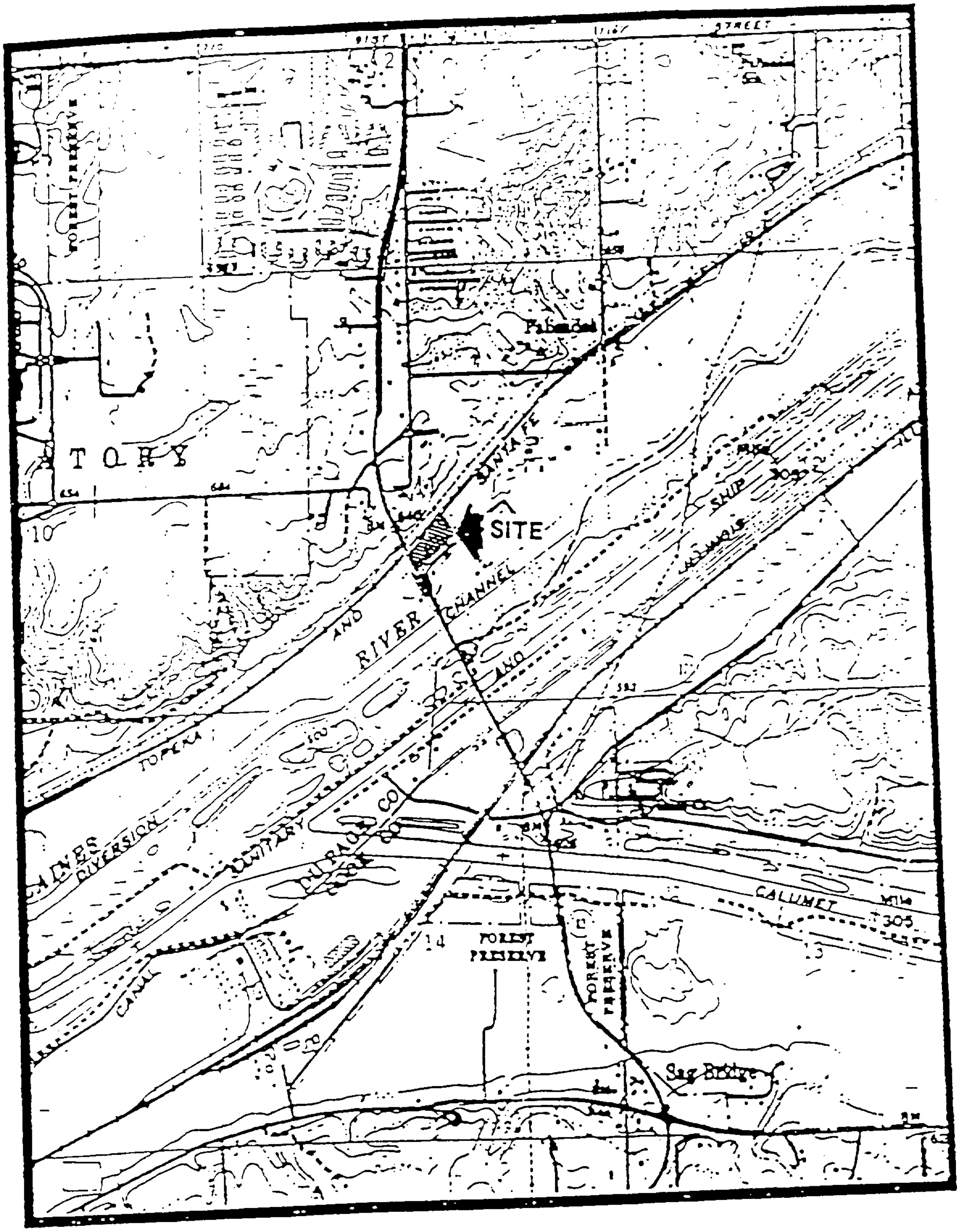
Table 15. Potential Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATIONS	TIME
Groundwater	Surface wastes Nonaqueous layer Contaminated soils Contaminated surface water	Groundwater	New wells Surface water use	Ingestion Inhalation	Residents downgradient or downstream	Future
		Indoor air	Indoor air		Residents with basements	
Sediments	Contaminated soil Surface water Surface runoff Air deposition	Sediment receiving settling contaminants	North drainageway	Ingestion Direct contact	Fishermen Hunters Waders	Past Present Future
			Des Plaines River	Ingestion Direct Contact	Dredging workers Downstream use of water	Future
Soil	Subsurface contamination Nonaqueous layer	Surface and subsurface soil	On-site activities	Inhalation Direct Contact	Workers Trespassers	Present Future

APPENDIX B - Figures 1-7

The figures are taken from reports cited on each figure and in the references, and are maps of the site and surrounding areas.

ILLINOIS
7.5 MINUTE SERIES (TOPOGRAPHIC)
1963
PHOTOREVISED 1973
PHOTOINSPECTED 1978



SCALE 1:24000

1 .5 0 1 MILE

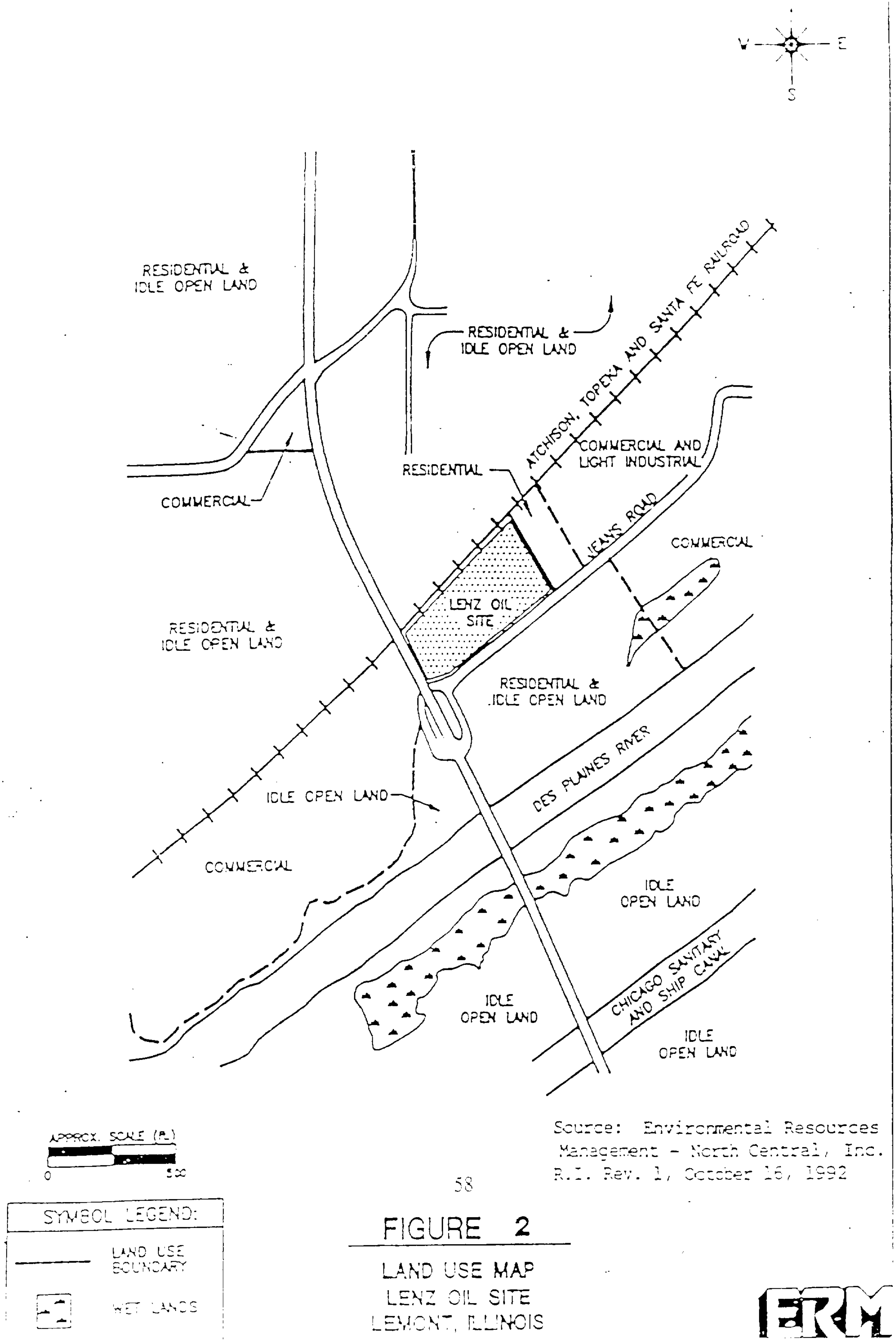
CONTOUR INTERVAL 5 FEET

FIGURE 1

SITE LOCATION MAP
LENZ OIL SITE

Source: Environmental Resources Management - North Central, Inc. Tech. Memo No. 1, May 2, 1991.

0263 | THI | MIAS | 8/1/91 | LENZ OIL

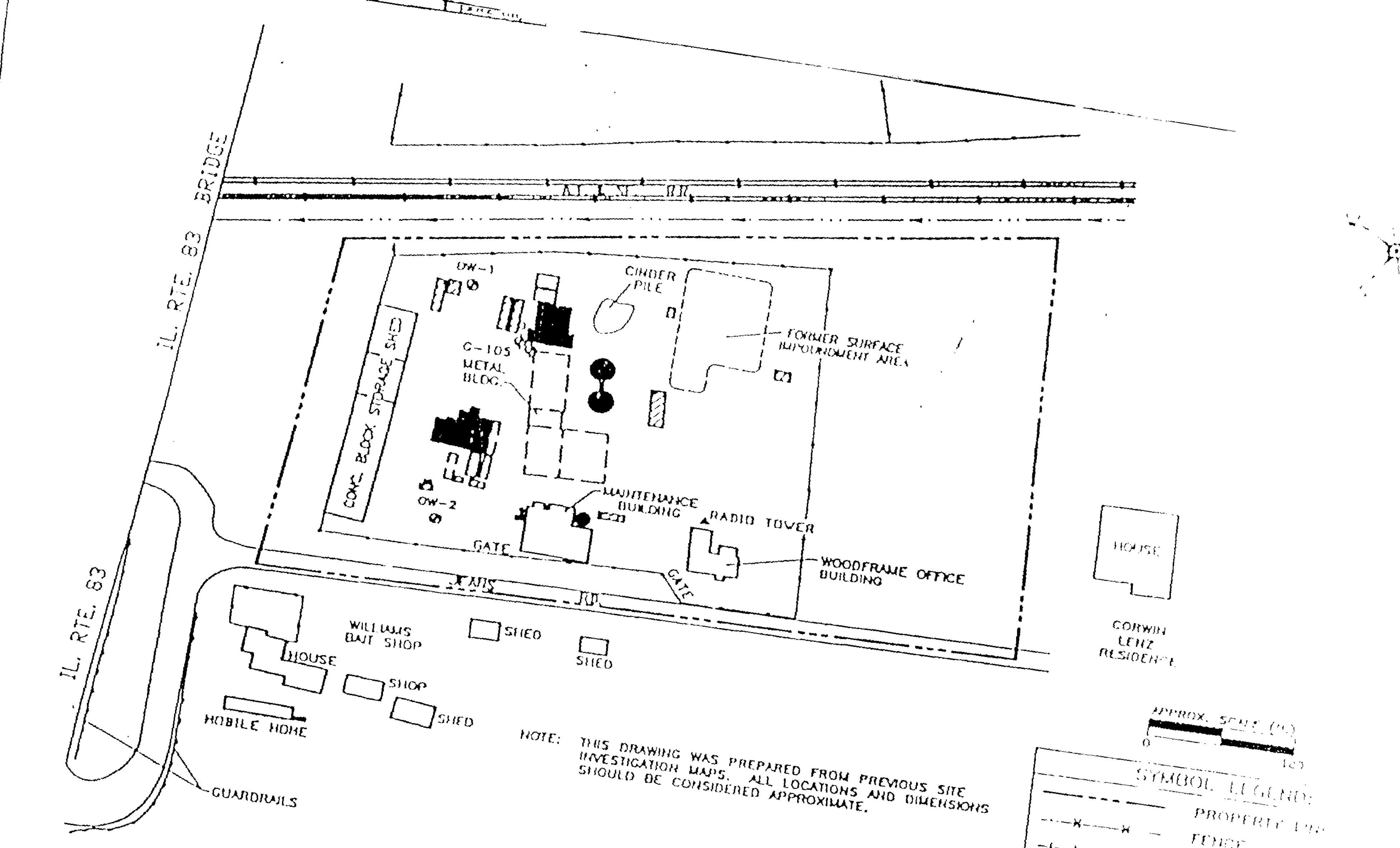


Source: Environmental Resources Management - North Central, Inc. R.I. Rev. 1, October 16, 1992

FIGURE 2

LAND USE MAP
LENZ OIL SITE
LEMONT, ILLINOIS

ERM



ERM

Source: Environmental Resources Management - North Central, Inc. R.I. Rev.1 10/16/92

FIGURE 3

PRE-REMEDIATION SITE FEATURES MAP
LENZ OIL SITE
LEMONT, ILLINOIS

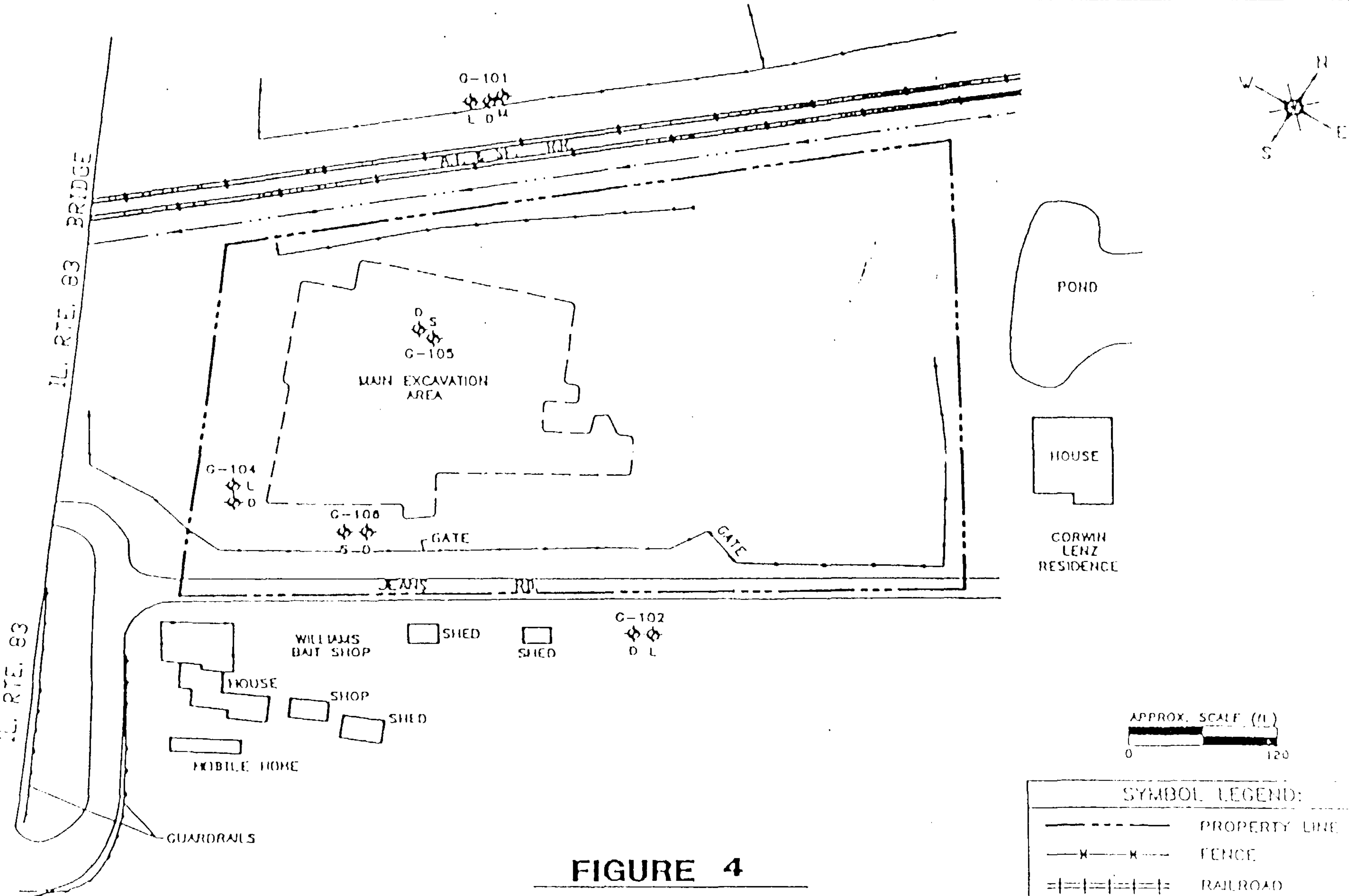


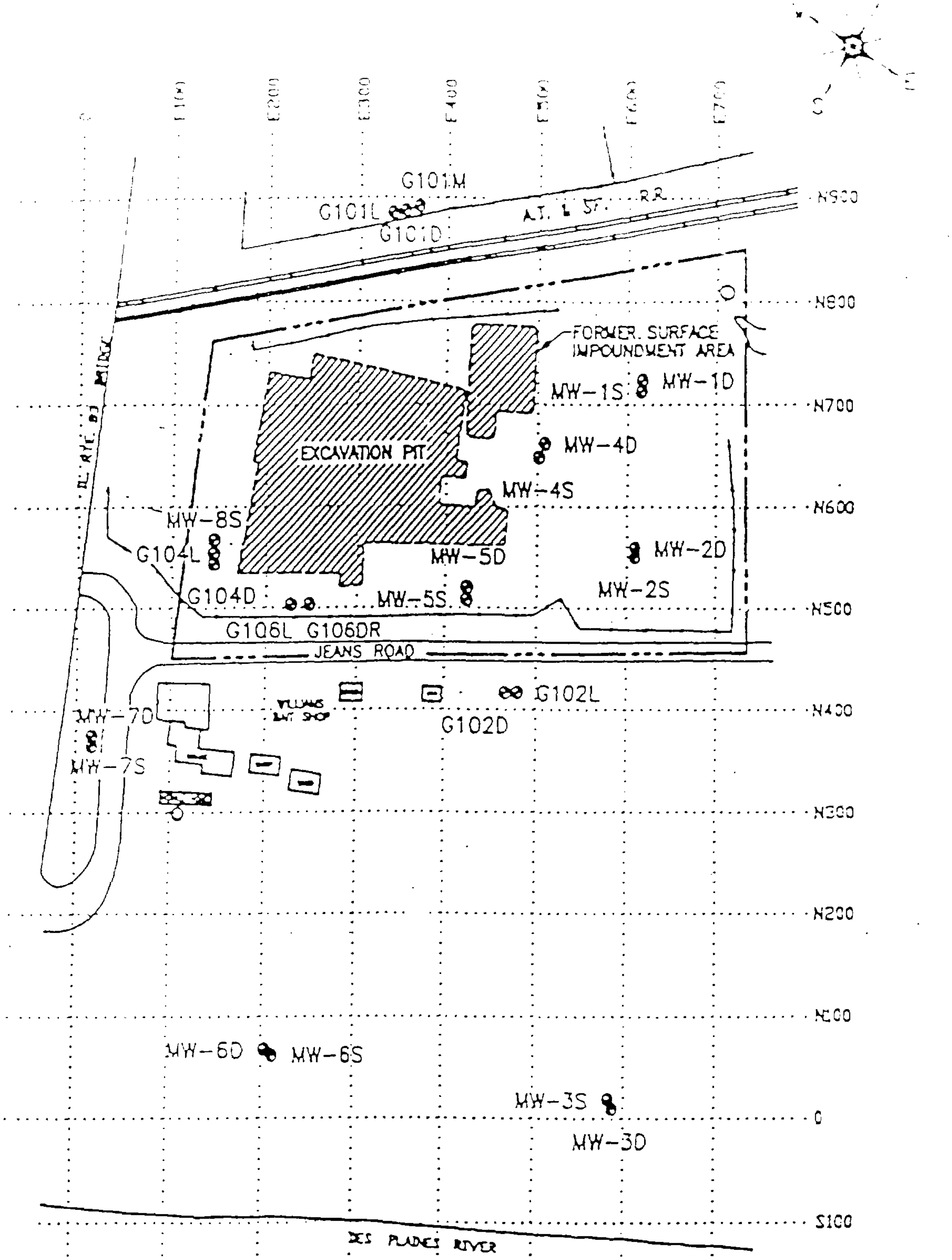
FIGURE 4

POST-REMEDIATION SITE FEATURES MAP
LENZ OIL SITE
LEMONT, ILLINOIS

Source: Environmental Resources Management - North Central, Inc.
R.I. Rev. 1, October 16, 1992.

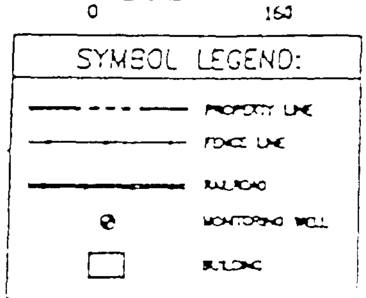
ERM

	RI	CW		6/26/92		LENZ OIL



APPROX. SCALE (ft.)

0 160



NOTE:
THE LOCATIONS AND DIMENSIONS OF THE MAIN EXCAVATION AND THE FORMER SURFACE IMPOUNDMENT AREAS SHOULD BE CONSIDERED APPROXIMATE.

Source: Environmental Resources Management - North Central, Inc. R.I. Revision 1, October 16, 1992

FIGURE 5

MONITORING WELL LOCATION MAP
LENZ OIL SITE
LEMONT, ILLINOIS

ERM

0232-7 RI MO- 7/14/92 LENZ OIL

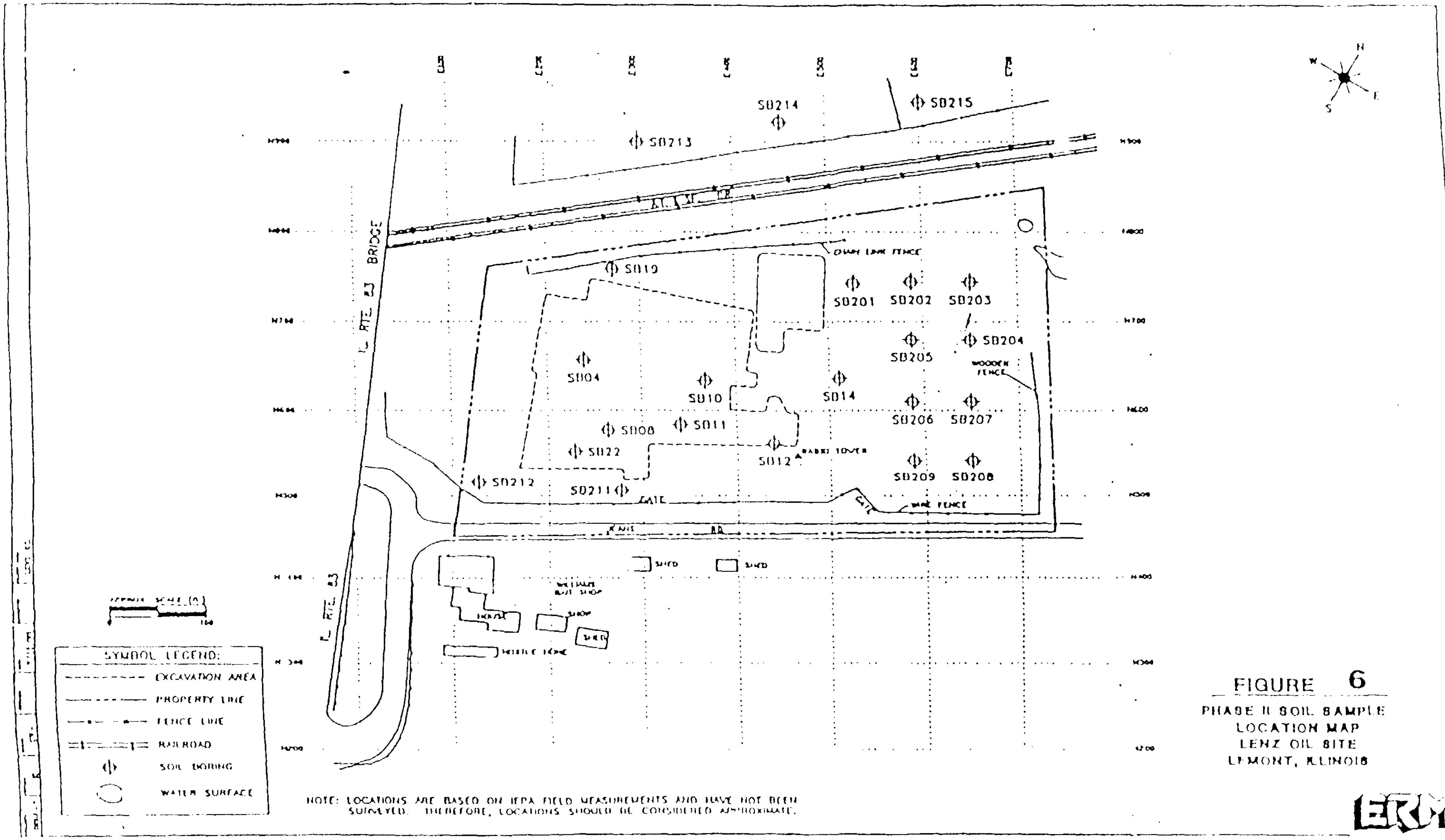


FIGURE 6

PHASE II SOIL SAMPLE LOCATION MAP
LENZ OIL SITE
LEMONT, ILLINOIS

SOURCE: ENVIRONMENTAL RESOURCES MANAGEMENT - NORTH CENTRAL, INC.
REMEDIAL INVESTIGATION REPORT, REV. 1, OCTOBER 16, 1992.

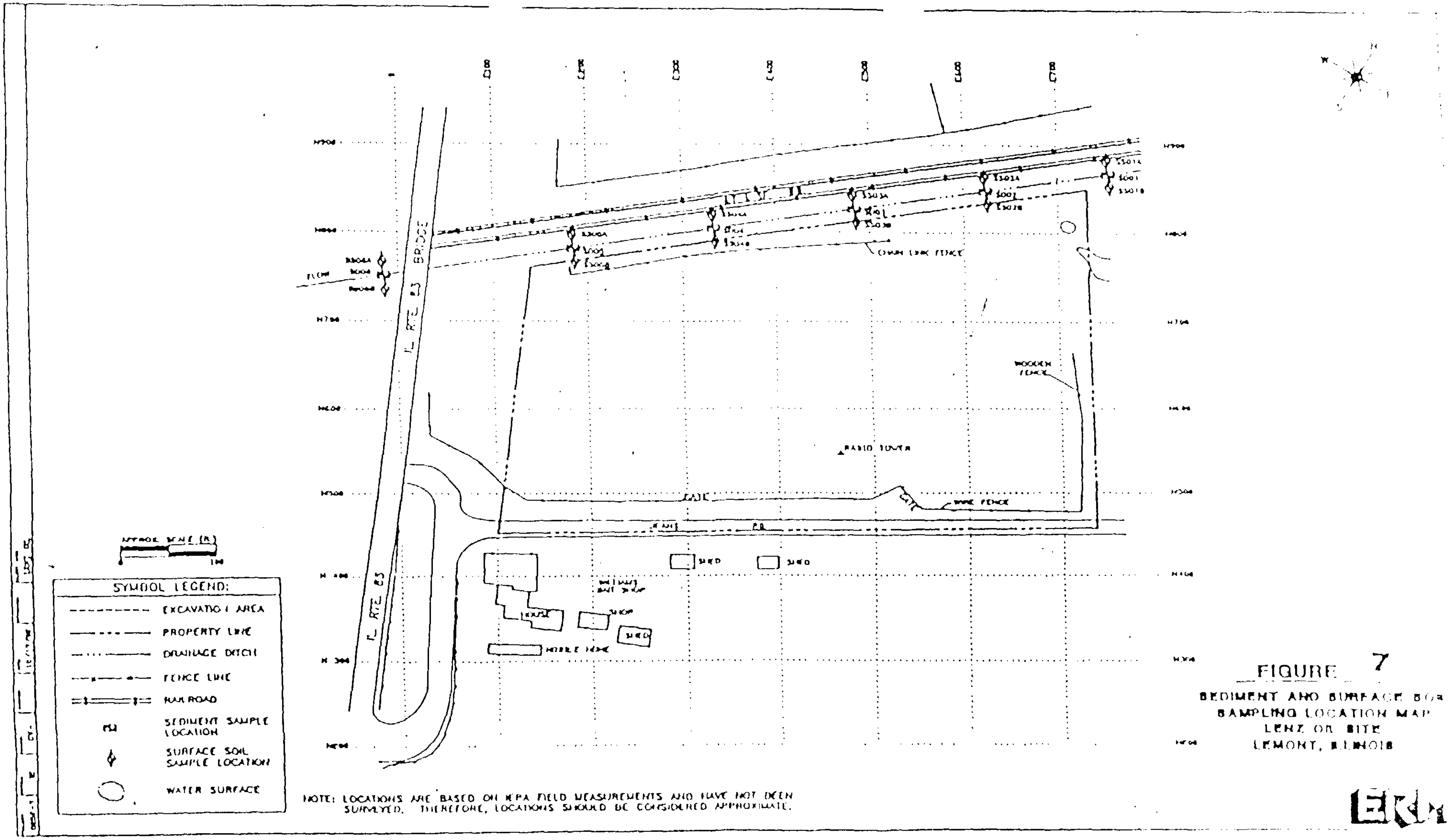


FIGURE 7
SEDIMENT AND SURFACE SOIL SAMPLING LOCATION MAP
LENZ OIL SITE
LEMONT, ILLINOIS

SOURCE: ENVIRONMENTAL RESOURCES MANAGEMENT - NORTH CENTRAL, INC.
REMEDIAL INVESTIGATION REPORT, REV. 1, OCTOBER 16, 1992.